FINAL ENVIRONMENTAL ASSESSMENT

Reducing Beaver Damage Through an Integrated Wildlife Damage Management Program in the State of Minnesota

Prepared By:
UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

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SUMMARY OF PROPOSED ACTION

The United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (WS) proposes to administer and continue the current WS beaver (*Castor canadensis*) damage management program in the State of Minnesota. An Integrated Wildlife Damage Management (IWDM) approach would be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources, and public health and safety. Damage management would be conducted on property in Minnesota when the resource owners (property owners) or managers request assistance to alleviate beaver damage and fund the project. Some of the types of damage that resource owners seek to alleviate are: flooding of agricultural land and roads, prevention of road and railroad bed failure due to impounded water, protection of ornamental trees from cutting, protection of commercial trees and tree plantations from cutting and flooding, structural degradation of stormwater ditches, protection of habitat for native wildlife and fisheries species and a reduction of wildlife hazards to aviation at airports. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using: body-grip (e.g., Conibear-type) traps, snares, leg-hold traps, and shooting. When appropriate, beaver dams could be breached using binary explosives or by hand. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested and funded by the cooperator, on private or public property after an *Agreement for Control* or other comparable document has been completed. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

ACRONYMS

ADC	Animal Damage Control
APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BATF	Bureau of Alcohol, Tobacco and Firearms
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FY	Fiscal Year
IWDM	Integrated Wildlife Damage Management
LLR-DRM	Leech Lake Reservation - Division of Resource Management
MBAH	Minnesota Board of Animal Health
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MIS	Management Information System
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NOA	Notice of Availability
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
UME	University of Minnesota - Extension Service
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

NOTE: On August 1, 1997, the Animal Damage Control program was officially renamed to Wildlife Services. The terms Animal Damage Control, ADC, Wildlife Services, and WS are used synonymously throughout this Environmental Assessment.

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.0 INTRODUCTION

Across the United States, wildlife habitat has been substantially changed as human populations expand and land is used for human needs. These human uses and needs often compete with wildlife which increases the potential for conflicting human/wildlife interactions. In addition, segments of the public desire protection for all wildlife; this protection can create localized conflicts between human and wildlife activities. The *Animal Damage Control Programmatic Final Environmental Impact Statement* (EIS) summarizes the relationship in American culture of wildlife values and wildlife damage in this way (United States Department of Agriculture (USDA) 1997):

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well.*"

Wildlife damage management is the science of reducing damage or other problems caused by wildlife and is recognized as an integral part of wildlife management (The Wildlife Society 1992). Wildlife Services (WS) uses an Integrated Wildlife Damage Management (IWDM) approach, known as Integrated Pest Management (WS Directive 2.105[1]), in which a combination of methods may be used or recommended to reduce wildlife damage. IWDM is described in Chapter 1:1-7 of USDA (1997). These methods may include alteration of cultural practices and habitat and behavioral modification to prevent or reduce damage. The reduction of wildlife damage may require that the local populations of offending animal(s) be reduced through lethal means.

Biological carrying capacity is the land or habitat's limit for supporting healthy populations of wildlife without degradation to the animals' health or their environment over an extended period of time (Decker and Purdy 1988). Wildlife acceptance capacity, or cultural carrying capacity, is the limit of human tolerance for wildlife or the maximum number of a given species that can coexist compatibly with local human populations (Decker and Purdy 1988). These terms are especially important in urban areas because they define the sensitivity of a local community to a specific wildlife species. For any given damage situation, there will be varying thresholds by those directly and indirectly affected by the damage. This threshold of damage is a primary limiting factor in determining the wildlife acceptance capacity. While the State of Minnesota has a biological carrying capacity to support more than the current number of beaver, the wildlife acceptance capacity is often much lower. Once the wildlife acceptance capacity is met or exceeded, people will begin to implement population or damage reduction methods, including lethal management methods, to alleviate property damage and public health or safety threats.

This environmental assessment (EA) documents the analysis of the potential environmental effects of a proposed Minnesota WS beaver (*Castor canadensis*) damage management program to achieve a balance between the biological carrying capacity and cultural carrying capacity. This analysis relies mainly on existing data contained in published documents (Appendix A), including the *Animal Damage Control Program Final Environmental Impact Statement* (USDA 1997) to which this EA is tiered. USDA (1997) may be obtained by contacting the USDA, Animal and Plant Health Inspection Service (APHIS), WS Operational Support Staff at 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

WS is the federal agency directed by law and authorized to protect American resources from damage associated with wildlife (Animal Damage Control Act of March 2, 1931, as amended 46 Stat. 1486; 7 USC. 426-426c and the

[1] WS Policy Manual - Provides guidance for WS personnel to conduct wildlife damage management activities through Program Directives. WS Directives referenced in this EA can be found in the manual but will not be referenced in the Literature Cited Appendix.

Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988, Public law 100-102, Dec. 27, 1987. Stat. 1329-1331 (7 USC 426C)). To fulfill this Congressional direction, WS activities are conducted to prevent or reduce wildlife damage caused to agricultural, industrial and natural resources, property, and threats to public health and safety on private and public lands in cooperation with federal, state and local agencies, private organizations, and individuals. Therefore, wildlife damage management is not based on punishing offending animals but as one means of reducing damage and is used as part of the WS Decision Model (Slate et al. 1992). The imminent threat of damage or loss of resources is often sufficient for individual actions to be initiated. The need for action is derived from the specific threats to resources or the public.

Normally, according to the APHIS procedures implementing the National Environmental Policy Act (NEPA), individual wildlife damage management actions are categorically excluded (7 CFR 372.5(c), 60 Fed. Reg. 6,000-6,003, (1995)). WS has decided in this case to prepare this EA to facilitate planning, interagency coordination, and the streamlining of program management, and to clearly communicate with the public the analysis of individual and cumulative impacts. In addition, this EA has been prepared to evaluate and determine if there are any potentially significant or cumulative impacts from the proposed and planned damage management program. All wildlife damage management that would take place in Minnesota would be undertaken according to relevant laws, regulations, policies, orders and procedures, including the Endangered Species Act (ESA). Notice of the availability of this document will be published in newspapers, consistent with the agency's NEPA procedures.

WS is a cooperatively funded, service-oriented program from which other governmental agencies and entities may request assistance. Before any wildlife damage management is conducted, Cooperative Agreements, Agreements for Control or other comparable documents are in place. As requested, WS cooperates with land and wildlife management agencies to reduce wildlife damage effectively and efficiently according to applicable federal, State and local laws and Memorandums of Understanding (MOUs) between WS and other agencies. WS's mission, developed through its strategic planning process, is: 1) *"to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and 2) to safeguard public health and safety."* WS's Policy Manual reflects this mission and provides guidance for engaging in wildlife damage management through:

- Training of wildlife damage management professionals;
- Development and improvement of strategies to reduce losses and threats to humans from wildlife;
- Collection, evaluation, and dissemination of management information;
- Informing and educating the public on how to reduce wildlife damage;
- Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1999a)

1.1 Beaver Ecology

The beaver, figure 1.1, is the largest North American rodent. Adult beaver generally weigh from 35-50 lbs., with individuals occasionally attaining weights up to 100 lbs. The beaver has several physical adaptations for life in an aquatic environment; webbed rear feet, a prominent dorsoventrally flattened tail, valvular nose and ears, lips that close behind the four large incisor teeth and dense waterproof fur (Miller and Yarrow 1994).

Beavers are found throughout North America, except for arctic tundra, peninsular Florida and southwestern desert areas. The species may be locally abundant wherever suitable habitat is found (Miller and Yarrow 1994).

Beaver habitat is almost anywhere there is a year-round source of water and an adequate food source. Beavers modify their habitat by building dams to impound water to provide access to food sources and security. Dams are usually built of mud and sticks, but rocks, cornstalks and other available materials are also occasionally used (Miller and Yarrow 1994).

Beavers build a house, or lodge, of mud and sticks, or inhabit a bank den for warmth, security and raising their young (Miller and Yarrow 1994).

Beavers eat the bark of a variety of trees and also feed on herbaceous and aquatic vegetation when it is available. In Minnesota, tree species preferred by beaver are aspen (*Populus spp.),* willow (*Salix spp.),* birch (*Betula spp.)* and alder (*Alnus rugosa)* (Longley and Moyle 1963).

Beavers are generally monogamous and live in family groups, sometimes mistakenly referred to as "colonies", made up of a breeding pair and offspring from 1-2 previous generations, numbering 2-13 (Longley and Moyle1963). These family groups are territorial and will defend their territory from other beavers (McNeely 1995). In northern areas, like Minnesota, beaver usually mate in February and March with an average of 2-6 young being born approximately 105-107 days later (Novak 1987). Young beaver usually remain in their natal colony until sexual maturity at approximately 2 years old, when they disperse to suitable habitat and establish their own territory (Miller 1994).

Beaver densities vary according to food supply, harvest rates and other factors. The Minnesota Department of Natural Resources (MDNR) conducts annual aerial surveys of active beaver houses on prescribed routes each fall. Their density data is expressed in terms of live colonies per route mile (LC/M). In 2000 beaver densities ranged from .33 LC/M - 2.73 LC/M, with a statewide average of .58 LC/M (MDNR 2000).

Though the carrying capacity of beaver habitat has not been well defined, there have been cases of overpopulation causing habitat destruction and subsequent declines in populations (Yeager and Ruthford 1957, Longley and Moyle 1963, Bedmarik and Weeks 1971). The highest beaver densities identified by MDNR from 1975-2000 during aerial surveys were 3.55 live colonies/stream mile, this is in an untrapped population (MDNR 2000).

Beaver have few natural predators aside from humans. Wolves regularly hunt and kill beaver during open water periods (Shelton and Peterson 1983). Other predators including coyotes, bobcats, mountain lions, river otter, bears, wolverines and mink, who prey on the young, have been known to kill beaver (Miller and Yarrow 1994).

1.2 HISTORICAL BEAVER MANAGEMENT

Historically, beaver harvests were unregulated and led to serious population declines by the late 1800's. Beaver were completely protected by the State of Minnesota in 1909. As beaver populations recovered, reports of beaver damage increased. In 1919, nuisance beaver were allowed to be taken under permit, but there was still no public trapping season (Longley and Moyle 1963).

The first regulated beaver season in Minnesota began in 1939, with annual limits of 4-10 beaver per trapper, depending on area of the state. These limits continued through 1948, with the exception of 1943-44 when the season was completely closed (Longley and Moyle 1963).

From 1949 through the 1975-76 season, there was an annual limit of 10 beaver per trapper. In 1976, the season was closed due to fire danger. From 1977 through the 2000-2001 season, there has been a beaver season of varying lengths with no annual limit on the number of beaver taken per trapper.

1.2.1 Beaver damage management in Minnesota

The MDNR is the primary Minnesota agency responsible for beaver management at the population level, and assists other agencies and individuals in local nuisance and damage control. Historically, the MDNR Division of Enforcement has handled the majority of beaver damage complaints, and the MDNR Section of Wildlife has primarily managed harvest and conducted aerial censuses (MDNR 1993).

Prior to 1990, MDNR Conservation Officers were directly involved in the removal of nuisance beavers and the removal of beaver dams. In 1990 in response to budgetary constraints, the MDNR eliminated dam and beaver removal, except on state lands, but continued to provide technical assistance to landowners and others experiencing beaver damage (MDNR 1993).

The MDNR uses the public beaver trapping harvest during the open beaver season as its primary tool to manage beaver damage in the state. During the period of 1990-2000, annual statewide beaver harvests have ranged from 44,000 - 113,000 (average = 72,100) per year in Minnesota. The beaver harvest is closely related to the price of beaver pelts, so management by trapping, though an effective tool, is not very precise. It is unlikely the MDNR will be able to effectively contain beaver populations in the near future solely by means of trapping harvest (MDNR 1993).

In addition to public beaver harvests to reduce beaver damage, the MDNR issues special beaver permits to private landowners or their agents to remove beaver causing damage to private property.

The MDNR has also promoted the use of the Clemson beaver pond leveler to reduce flooding damage caused by beaver.

From 1994-2000, the Minnesota Department of Agriculture (MDA) operated a beaver damage control grant program.

The MDA was appropriated $50,000 by the Minnesota legislature to begin a beaver damage control grant program in response to an increase in beaver damage, primarily in northwestern Minnesota. The grant requires a funding match from a joint powers board made up of two or more governmental or tribal units.

This MDA program grew to $100,000 annually available in grants and expanded its geographic area to cover nearly 50% of the state.

The MDA program made use of a bounty or "harvest incentive" to remove beaver from identified damage sites in enrolled areas. Funding was also available through the MDA program to remove beaver dams.

As of January 2001, the MDA received word via the governor's budget that would there would be no state funds appropriated by the legislature for continuing the program. The primary reason cited was that the $100,000 annually appropriated was not enough to effectively deal with beaver damage on a statewide basis (B. Balk, MDA, pers. commun.)

In 1997 in response to a growing number of requests for assistance, WS began providing operational beaver damage management assistance (in a limited area) to timber companies, private landowners, MDNR, Minnesota Department of Transportation (MNDOT), and others experiencing beaver damage who were willing to reimburse WS for costs incurred in conducting beaver damage management activities. WS personnel employ a variety of methods for reducing beaver damage which allows greater flexibility and more opportunity to formulate an effective strategy for each request for assistance (see Appendix C).

1.3 BEAVER ACTIVITY IMPACTS TO THE ENVIRONMENT AND SOCIETY ATTITUDES

1.3.1 Benefits of Beaver Activities

Although beaver may cause extensive damage, there are also benefits associated with their activities depending on the activities and location. Beaver ponds create valuable palustrine wetland habitat that provides habitat for many species of fish and wildlife (Arner and Hepp 1989, Hill 1982, Novak 1987). These wetland ecosystems also

function as sinks, helping to filter nutrients and reduce sedimentation, thereby maintaining the quality of nearby water systems (Arner and Hepp 1989). According to the EPA, wetlands can provide aesthetic and recreational opportunities for wildlife observation, nature study, hunting, fishing, trapping, wildlife photography, livestock water, and environmental education and added an estimated $59.5 million to the national economy in 1991(EPA 1995, Woodward 1983, Wade and Ramsey 1986).

Beaver pond wetland habitats can be valuable and productive ecosystems (Arner and Hepp 1989). Beaver ponds contribute to the stabilization of water tables, help reduce rapid run-off from rain (Wade and Ramsey 1986), and serve as basins for the entrapment of streambed silt and eroding soil (Hill 1982). Silt-laden waters, particularly carrying eroded soil from cultivated, logged, excessively grazed, farmed, mountainous, or developed areas, slow as they pass through a series of beaver ponds and the heavier particles and colloidals are able to settle out before the water flows into larger streams (Hill 1982). Aquatic and early successional plant species may become established in the newly deposited sediment, allowing conditions to become favorable for the stabilization of the flood plain by more permanent woody vegetation (Hill 1982). The Minnesota Department of Natural Resources has computed a cost of $300 to replace, on average, each acre-foot of flood water storage that wetlands can provide (EPA 1995). Producing wetlands/marsh habitat through beaver management in New York was far less costly than developing either small or large manmade marshes, assuming the quality is equal in each case (Ermer 1984).

Beaver ponds may also improve soil quality and provide improved habitat for fish and invertebrates. The anaerobic conditions caused by beaver impoundments may result in the accumulation of ammonium, so that soil storage of inorganic nitrogen is nearly tripled by beaver impoundments during a 50 year period (Johnston 1994). Arner et al. (1969) found that the bottom soils of beaver ponds in Mississippi were generally higher in phosphate, potash, and organic matter than the bottom soils of feeder streams. Greater biomass of invertebrates were also found in beaver ponds than in feeder streams (Arner and DuBose 1982).

Habitat modification by beaver, primarily dam building and tree cutting, can benefit many species of wildlife (Jenkins and Busher 1979, Medin and Clary 1990, Medin and Clary 1991, Arner and DuBose 1982, Arner and Hepp 1989, Hill 1982). Beaver may increase habitat diversity by flooding and opening forest habitats, which results in greater interspersion of successional stages and subsequently increases the floral and faunal diversity of a habitat (Arner and Hepp 1989, Hill 1982). The creation of standing water, edge, and plant diversity, all in close proximity, results in excellent wildlife habitat (Hill 1982). The resulting wetland habitat may be beneficial to some other mammals, fish, reptiles, amphibians, waterfowl, and other birds (Arner and DuBose 1982, Miller and Yarrow 1994, Naimen et al. 1986). When the ponds are abandoned, they progress through successional stages which improve feeding conditions for white-tailed deer (*Odocoileus virginianus*) and woodcock (*Philoela minor*) (Arner and DuBose 1982). In addition, beaver ponds may be beneficial to Threatened and Endangered (T&E) species, because the USFWS estimates that up to 43% of the T&E species rely directly or indirectly on wetlands for their survival (EPA 1995).

Waterfowl use beaver pond wetland habitats extensively (Arner and Hepp 1989, Speake 1955, Arner 1964, Novak 1987, Hill 1982). In particular, wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), black ducks (*Anas rubripes*), and other dabbling ducks benefit from the increased interspersion of cover and food found in flooded beaver ponds (Novak 1987, Arner and Hepp 1989). Also, the attraction of a beaver pond to waterfowl varies with age and vegetation (Arner and DuBose 1982). In Mississippi, beaver ponds over three years in age were found to have developed plant communities which increase their value as nesting and brood rearing habitat for wood ducks (Arner and DuBose 1982). However, Reese and Hair (1976) found that beaver pond habitats were highly attractive to a large number of birds year-round and that the value of the beaver pond habitat to waterfowl was minor when compared to other species of birds (Novak 1987). Beaver are generally considered beneficial where their activities do not compete with people's use of the land or property (Wade and Ramsey 1986). The opinions and attitudes of individuals, communities, organizations, etc., vary greatly and are primarily influenced and formed by the benefits and damage directly experienced by each person or entity (Hill 1982). Property ownership, options for public and private land use, and the effects on adjacent properties or land use impact public attitudes toward beaver (Hill 1982). In many cases, the beaver damage exceeds the benefits, resulting in a demand for beaver damage management.

Woodward et al. (1976) found that 24% of landowners who reported beaver activity on their property indicated benefits to having beaver ponds on their land and also desired assistance with beaver pond management (Hill 1976, Lewis 1979, Woodward et al. 1985).

1.3.2 Damage from Beaver Activities

Miller (1983) estimated that the annual damage in the United States was $75-$100 million. The value of beaver damage is perhaps greater than that of any other single wildlife species in the United States and was estimated to have exceeded $4 billion in the southeastern U.S. over a 40-year period (Arner and Dubose 1979). In some southeastern states, losses from beaver damage have been estimated at $3 million to $5 million dollars annually (Miller and Yarrow 1994), with timber losses as the most common type of damage (Hill 1982).

In Minnesota, beaver cause significant damage primarily as result of dam building and subsequent flooding, bank burrowing, tree cutting and obstructing overflow structures and spillways. The MDNR lists beaver as the wildlife species responsible for the second highest number of nuisance/damage calls in the state. Beaver are also listed as the second leading cause of economic damage by a wildlife species in the state. (MDNR 1993).

MDNR findings indicate Minnesota beaver damage issues in descending order of significance are:

1. Flooded roads (also including roadbed degradation, culvert washouts and resulting maintenance).
2. Flooded agricultural fields.
3. Flooded commercial timber.
4. Gnawing damage to commercial and ornamental trees.

In Minnesota, damage by beavers also affects fish and wildlife habitat, wild rice production, railroad transportation and aviation safety, and sensitive ecological areas like orchid bogs, white cedar swamps and common tern nesting areas.

Beaver damage to roads has been well documented (Miller and Yarrow 1994) and is common in Minnesota. Damage occurs when beavers plug a culvert under a road with mud, sticks and other material, causing the water to flow into the roadbed or over the road, instead of under the road, through the culvert. In some cases, during large rain or snowmelt events, roads can actually be washed out due to the water flowing over/through the road. The other type of beaver damage to roads is also caused by beaver dams, either at or downstream from the road, this causes water levels to rise to the point where the roadbed is saturated and prone to sloughing where portions of the road surface can fall into the water. These types of road damage can cause hazardous situations for vehicular travel on such roads. In New York, an estimated 19 workdays and $2,500 in repair costs were incurred for each beaver obstructed culvert (Jensen et. al. 1999).

Railroad beds are also impacted in the same way by beaver dams. At least one train derailment is known to have been related to a beaver dam causing damage to the tracks (Miller and Yarrow 1994).

Beaver damage agricultural fields and pastures primarily by flooding, but also by direct cutting of crops such as corn and soybeans, for food and dam building material.

Beaver damage to timber comes in two forms. First and most significant is damage caused by flooding of standing live timber. Upland tree species most commonly harvested for pulp/paper making, saw timber and other forest products usually die if flooded for more than one growing season. Beaver also directly damage standing timber by cutting down trees for food or dam and house building activities. Beaver also damage standing timber by gnawing or "barking" live trees to assess their nutritional value (Jenkins 1979) or expose pitch to lick from pine trees (Svendsen 1980b) which can stress or kill the tree.

Beaver impacts on trout habitat have been a major concern of fisheries managers since at least 1948 when Evans (1948) suggested a continued increase in beaver populations in Minnesota would probably result in deterioration of streams for trout. Patterson (1951) found that beaver impoundments in the Peshtigo River Watershed caused significant negative impacts to trout habitat by raising water temperatures, destroying immediate bank cover, changing water and soil conditions, and silting of spawning areas. The Wisconsin Department of Natural Resources guidelines for management of trout stream habitat stated that beaver dams are a major source of damage to trout streams (Churchill 1980, White and Brynildson 1967). More recent studies have documented improvements to trout habitat upon removal of beaver dams. Avery (1992) found that wild brook trout populations in tributaries to the North Branch of the Pemebonwon River in northeastern Wisconsin improved significantly following the removal of beaver dams. Also, the species abundance, species distribution, and total biomass of non-salmonids increased following the removal of beaver dams (Avery 1992). Following beaver and dam removal for two consecutive years on Little Hay Creek in east-central Minnesota, Newman et.al (1993) documented significant increases in trout density, trout biomass as well as non-trout species diversity and abundance. In addition, higher substrate diversity, resulting in more favorable spawning conditions were found following beaver and dam removal.

Walleyed pike (*Stizostedion vitreum*) are an important gamefish in Minnesota whose spawning activities can also be negatively impacted from beaver activities. Beaver dams impede walleye travel to spawning locations as well as cause decreased water flow resulting in sedimentation over rock-rubble substrate required for spawning (Lindner et. al 1998).

Nesting densities and nest success of ring-necked ducks (*Aytha affinis*) have declined at some locations due to beaver dams causing water levels to rise and flooding nesting habitat (T. Soule, MDNR pers. commun.).

Wild rice (*Zizania aquatica)* crops can be negatively impacted by beaver activities. Wild rice is an important food source for waterfowl and other wildlife species as well as people. Wild rice also has cultural significance to many American Indian tribes (Vennum 1988). Wild rice is damaged by flooding during a part of it's life cycle called the "floating leaf" stage where the plant is essentially growing on the surface of the water. When water levels increase at this stage, the plant is uprooted from the soft mud substrate it grows in, and dies (Vennum 1988).

Beaver often inhabit sites in or adjacent to urban/suburban areas and cut or girdle trees and shrubs in yards, undermine yards and walkways by burrowing, flood homes and other structures, destroy pond and reservoir dams by burrowing into levees, gnaw on boat houses and docks, and cause other damage to private and public property (Wade and Ramsey 1986).

Dam building activities by beaver causes flooding and this water attracts waterfowl, wading birds and other wildlife that may pose a threat to aviation safety (Transport Canada 1994). There is an estimated $300 million of damage from wildlife strikes annually in the U.S. to U.S. civil aircraft and 68 people have been killed in wildlife related aviation accidents in the U.S. and Europe since 1995 (Steenblik 2000).

Beaver can also negatively impact sensitive ecological areas. White cedar trees (*Thuja occidentalis)* are important to a variety of wildlife species, especially white-tailed deer (Coblentz 1970). Because of their status, white cedar are rarely harvested on public property in Minnesota and efforts are made by various land management agencies to preserve stands of white cedar (L. Hoyt, MDNR pers. commun.) Although tolerant of wet conditions, white cedars are negatively impacted by impeded water flow or complete flooding over extended periods, both of which can occur from beaver dams (Baughman et. al 1993).

In Minnesota, beaver have also negatively impacted common tern (*Sterna hirundo*) nesting areas. Common terns are listed as a state threatened species that nest on open beach areas (Peterson 1980). At the Leech Lake nesting colony, one of four known nesting colonies in the state, beaver have cut down shoreline stabilizing trees along the shoreline causing an increase in shoreline erosion and loss of common tern nesting habitat (S. Mortenson, LLR pers. commun.).

Beaver dams can also negatively impact T&E plant species. Bog adder's mouth *(Malaxis paludosa)*, classified by the MDNR as "endangered" and ram's-head lady's slipper *(Cypridium arietinum)*, state listed "threatened", require moist, but not saturated conditions and may be negatively impacted by beaver impoundments (S. Mortenson, LLR-DRM, pers. commun.).

Surveys in North Carolina and Alabama indicate that the majority of landowners with beaver damage on their property desire damage management via beaver removal (Hill 1976, Lewis 1979, Woodward et al. 1985). Loker et al. (1999) found that suburban residents may also desire lethal management methods to resolve beaver damage conflicts. Such conflicts, which are viewed as *"damage,"* result in adverse impacts that often outweigh benefits (Miller and Yarrow 1994).

1.3.3 Public Health and Safety Risks from Beaver Damage

Beaver are hosts for several ectoparasites and internal parasites including nematodes, trematodes, and coccidians. Beaver activity in certain situations can become a threat to public health and safety (e.g., burrowing into or flooding of roadways and railroad beds can result in serious accidents)(Miller 1983, Woodward 1983). Increased water levels in urban areas resulting from beaver activity can lead to unsanitary conditions and potential health problems by flooding septic systems and sewage treatment facilities (DeAlmeida 1987, Loeb 1994). Beaver damming activity also creates conditions favorable to mosquitoes and can hinder mosquito control efforts or result in population increases of these insects (Wade and Ramsey 1986). While the presence of these insects is largely a nuisance, mosquitoes can transmit diseases, such as encephalitis (Mallis 1982). In addition, beaver, which are carriers of the intestinal parasite *Giardia lamblia,* can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Beach and McCulloch 1985, Wade and Ramsey 1986, Miller and Yarrow 1994). The Centers for Disease Control have recorded at least 41 outbreaks of waterborne Giardiasis, affecting more than 15,000 people. Beaver are also known carriers of tularemia, a bacterial disease, that is transmittable to humans through bites by insect vectors or infected animals or by handling animals or carcasses which are infected (Wade and Ramsey 1986). Skinner et al. (1984) found that in cattle-ranching sections of Wyoming the fecal bacterial count was much higher in beaver ponds than in other ponds, something that can be a concern to ranchers and recreationists. On rare occasions, beaver may contract the rabies virus and attack humans. In February, 1999 a beaver attacked and wounded a dog and chased some children that were playing near a stream in Vienna, Virginia. Approximately a week later, a beaver was found dead at the site and tested positive for rabies (USDA 2000).

1.4 SCOPE AND PURPOSE OF THIS EA

The scope and purpose of this EA is to evaluate the potential impact from WS beaver damage management to protect agricultural and natural resources, property, and public health and safety in Minnesota. Damage problems can occur throughout the State, resulting in requests for WS assistance. Under the Proposed Action, beaver damage management could be conducted on private, federal, state, tribal, county, and municipal lands in Minnesota. In Fiscal Year (FY) 97 to (FY) 00, WS had 2, 4, 12, and 16 *Agreements for Control* to conduct beaver damage management in each year respectively (MIS 1997, 1998, 1999, 2000). Minnesota encompasses about 54,611,840 acres. WS anticipates that the proposed action would occur on no more than 0.01% of the land in Minnesota and no more than 1,000 beaver would be removed by MN WS annually. This estimate is based upon past *Agreements for Control* (MIS 1997, 1998, 1999, 2000) and anticipated increase in future WS beaver control activities.

1.5 NEED FOR BEAVER DAMAGE MANAGEMENT IN MINNESOTA

The need for action in Minnesota is based on the necessity of having a program to protect agricultural and natural resources, property, roads, bridges, railroads, and public health and safety from beaver damage. Beaver populations can have a negative economic impact and can be a threat to human health and safety in Minnesota. Currently, MDNR provides technical assistance, provides special beaver permits to remove beaver outside of the open season, and has a 7 month fur harvest season for the management of beaver and beaver related problems in the state. The MDNR does not provide direct control assistance to property owners within the State due to time and funding

constraints. The proposed action gives the property owner or manger the opportunity and option to have a government agency conduct beaver management activities on their properties. At times this option is desired by the property owner or manager due to the special expertise and services that WS can provide. An example would be providing both beaver removal and dam removal services at the same time. This combination of services is often not available from private individuals or trappers.

Comprehensive surveys of beaver damage in Minnesota have not been conducted. An estimate of the magnitude of damage can be derived from the amount of money various agencies have spent in responding to beaver damage. In 1993, the MDNR estimated it spent 11% of its animal damage control expenditures, or $61,710, responding to beaver damage. Prior to 1990 when the MDNR Division of Enforcement conducted beaver and dam removal, they spent an estimated 15,000 hours annually and had about $100,000 in direct expenses (MDNR 1993). The MDNR spent an average of $35,000 per year from 1992-1998 removing beaver and/or dams or inspecting streams for beaver damage (Mark Ebbers, MDNR, pers. commun.). In recent years, the MDA spent $100,000 annually on its beaver control grant program.

Minnesota WS compiled estimates of the types and dollar($) value of damage perceived by property owners, resource owners, or managers who requested WS assistance. Damage data obtained for FY97 through FY00 are summarized in Table 1-1 (MIS 1997, 1998, 1999, 2000). These data represent only a portion of the total dollar($) value of damage caused by beaver, because not all people who experience such damage request assistance from WS (Loven 1985). Under cooperative funding agreements and the request of the property owner or manager, beaver dams are removed by the MN WS program by the use of binary explosives or manually by hand. These dams are removed to drain off excess water that is causing flooding and to restore the water flow of streams and waterways that are blocked by beaver activity. In (FY) 97 to (FY) 00 MN WS removed a total of 1, 29, 29, and 8 beaver dams by explosives in each year, respectively (MIS 1997, 1998, 1999, 2000).

Table 1-1. Beaver Damage (in dollars) Verified by WS, FY 97-FY 00

Resource Category	1997	1998	1999	2000
Agriculture (includes field crops and commercial forestry)	250	2,600	500	7,000
Natural Resources (includes fish and wildlife habitat and standing timber)	0	2,500	9,400	2,650
Property (includes buildings, roads and bridges)	1,000	0	2,300	4,050
Total	1,250	5,100	12,200	13,700

1.6 PROPOSED ACTION

Wildlife Services proposes to administer and continue the current beaver damage management program in the State of Minnesota. An IWDM approach could be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources, and public health and safety on all lands in Minnesota where a need exists and a request is received and cooperator funding is available. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using: body-grip (e.g., Conibear-type) traps, snares, leg-hold traps, and shooting. When appropriate and necessary, beaver dams would be breached using binary explosives or by hand. In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

1.7 OBJECTIVES FOR THE MINNESOTA WS BEAVER DAMAGE MANAGEMENT PROGRAM

1.7.1 Attempt to balance the needs of the beaver as a dynamic part of the ecosystem and a fur resource, with the need to minimize damage to human interests.

1.7.2 Respond to all beaver damage problems within 2 (two) weeks.

1.7.3 Keep the take of non-target otters (*Lutra canadensis*) below 10% of the total take during beaver damage management operations.

1.8 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL DOCUMENTS

1.8.1 ADC Programmatic EIS. WS has issued a final EIS (USDA 1997) and Record of Decision on the National APHIS-WS program. This EA is tiered to that EIS.

1.9 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should the integrated beaver damage management program, as currently implemented by WS, be continued in Minnesota?
- If not, should WS attempt to implement one of the alternatives to an IWDM strategy as described in the EA?
- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.10 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.10.1 Actions Analyzed. This EA evaluates beaver damage management to protect property, agricultural and natural resources, roads, bridges, railroads, and public health and safety in Minnesota.

1.10.2 Wildlife and Fisheries Species Potentially Protected by Minnesota WS. Minnesota WS assistance may be requested to achieve management objectives for native wildlife and fisheries, including T&E species. If other needs are identified, a determination would be made on a case-by-case basis if additional NEPA analysis is needed.

1.10.3 American Indian Lands and Tribes. Minnesota WS has conducted beaver damage control work on tribal lands in the past in cooperation with the MDNR. Currently WS does not have any MOUs or signed agreements with any American Indian tribe in Minnesota. If WS enters into an agreement with a tribe for beaver damage management, this EA would be reviewed and supplemented if appropriate to insure compliance with NEPA.

1.10.4 Period for which this EA is Valid. This EA would remain valid until Minnesota WS and other appropriate agencies determine that new needs for action, changed conditions or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented pursuant to NEPA. Review of the EA would be conducted each year to ensure that the EA is sufficient.

1.10.5 Site Specificity. This EA analyzes the potential impacts of beaver damage management and addresses activities on all lands in Minnesota under MOU, Cooperative Agreement, and in cooperation with the appropriate public land management agencies. It also addresses the impacts of beaver damage management on areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and because the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional wildlife damage management efforts could occur. Thus, this EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program. This EA emphasizes major issues as they relate to specific areas whenever possible, however, many issues apply wherever beaver damage and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al. 1992) would be the site-specific procedure for individual actions conducted by WS in Minnesota (see Chapter 3 for a description of the Decision Model and its application).

1.10.6 Public Involvement/Notification. As part of this process, and as required by the Council on Environmental Quality (CEQ) and APHIS-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) published in local media and through direct mailings of NOA to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.11 PREVIEW OF THE REMAINDER OF THIS EA

The remainder of this EA is composed of four (4) chapters and three (3) appendices. Chapter 2 discusses and analyzes the issues and affected environment. Chapter 3 contains a description of each alternative, alternatives not considered in detail, mitigation and standard operating procedures (SOP). Chapter 4 analyzes consistency with environmental consequences and the environmental impacts associated with each alternative considered in detail. Chapter 5 contains the list of preparers of this EA. Appendix A is the literature cited used during the preparation of the EA, Appendix B is the authorities for conducting wildlife damage management in Minnesota, and Appendix C is a detailed description of the methods used for beaver damage management.

CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.0 INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences), issues used to develop mitigation measures and SOPs, and issues not considered in detail, with the rationale. Pertinent portions of the affected environment are included in this chapter in the discussion of issues used to develop mitigation. Additional affected environments are incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program in Chapter 3.

2.1 AFFECTED ENVIRONMENT

The areas of the proposed action could include any property, public or private, where beaver damage is occurring in the state, a request for assistance is made and a cooperator is funding the project.

2.2 ISSUES ANALYZED IN DETAIL IN CHAPTER 4

The following are issues that have been identified as areas of concern requiring consideration in this EA and were used to develop mitigation measures:

- Effects on beaver populations
- Effects on native fish, wildlife and plant species, including T&E species
- Effects on public and pet health and safety
- Humaneness of methods to be used
- Impacts to stakeholders, including aesthetics

2.2.1 Effects on beaver populations.

Some persons are concerned that the proposed action or any of the alternatives would result in the loss of local beaver populations or could have a cumulative adverse impact on regional or statewide beaver populations.

2.2.2 Effects on native fish, wildlife and plant species, including T&E species.

A common concern among members of the public and wildlife professionals, including WS personnel, is that the proposed action or any of the alternatives would result in removing individuals or adversely impact populations of native fish or other wildlife species, particularly T&E species. Special efforts are made to avoid jeopardizing Threatened and Endangered species through biological evaluations of the potential effects and the establishment of special restrictions or mitigation measures. WS has consulted with the USFWS under Section 7 of the Endangered Species Act (ESA) concerning potential impacts of beaver damage management methods on T&E species and has obtained a Biological Opinion (B.O.). For the full context of the B.O., see Appendix F of the ADC FEIS (USDA 1997, Appendix F). WS's Standard Operating Procedures (SOP's) include measures intended to mitigate or reduce the effects on non-target species populations and are described in other sections of this EA. Currently there are 12 species federally listed as Threatened or Endangered in Minnesota and 183 species listed as endangered or threatened by the Minnesota DNR WS's mitigation and SOPs that are designed to reduce the adverse effects on non-target species and to avoid jeopardizing T&E species' populations are presented in Chapter 3.

The USFWS has concurred with WS that beaver damage management activities would have no adverse effect on federally Threatened or Endangered species in Minnesota (P. Burke, USFWS, letter to J. Hart, WS Feb. 28, 2001). WS will conform to the only specific mitigation measure recommended by the USFWS which was regarding dam removal with explosives near active bald eagle nests (P. Delphey, USFWS, letter to J. Hart, WS, March 14, 2001). For Specific Mitigation Measures see Appendix D.

The Minnesota DNR has indicated that WS beaver damage management activities would have no adverse effect on state listed animal species. The MDNR did recommend specific mitigation measures to prevent adverse effects to two state listed species; small white waterlily (*Nymphaea leibergii*), state threatened, and floating marsh marigold (*Caltha natans*) state endangered (B. Eliason, MDNR, letter to J. Hart, WS, March 16, 2001). WS will conform to these mitigation measures as described. None of the remaining 121 state listed plants are expected to be negatively impacted by WS beaver management activities.

2.2.3 Effects on public and pet health and safety.

A common concern is whether the proposed action or any of the alternatives pose an increased threat to public and pet health and safety. In particular, there is concern that the lethal methods of beaver removal (i.e., trapping and shooting) may be hazardous to people and pets, or that continued increases in beaver populations might threaten public and pet health or safety.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and firearms misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

2.2.4 Humaneness of methods to be used.

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals related that 58% of their respondents, "*. . . care more about the suffering of individual animals . . . than they do about species population levels.*" Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if "*. . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process.*"

Suffering has been described as a "*. . . highly unpleasant emotional response usually associated with pain and distress.*" However, suffering "*. . . can occur without pain . . .*," and "*. . . pain can occur without suffering . . .* " (American Veterinary Medical Association (AVMA) 1986). Because suffering carries with it the implication of a time frame, a case could be made for "*. . . little or no suffering where death comes immediately . . .* " (California Department of Fish and Game (CDFG) 1991), such as the WS technique of shooting.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "*. . . probably be causes for pain in other animals . . .* " (AVMA 1986). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1991). Some WS damage management methods such as leg-hold traps and body snares, may thus cause varying degrees of pain in different animal species for varying time frames. At what point pain diminishes or stops under these types of restraint has not been measured by the scientific community.

Pain and suffering as it relates to a review of WS damage management methods to capture animals, has both a professional and lay point of arbitration. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since "*. . . neither medical or veterinary curricula explicitly address suffering or its relief*" (CDFG 1991).

The 330 conibear, a common beaver trap and one used by WS, has met International Humane Trapping Standards (IHTS) as a killing trap for beaver (Fur Institute of Canada, 10/1/98). Other beaver sized conibear type traps have since met IHTS standards for humaneness, both on land and underwater (Fur Institute of Canada 8/1/2001).

Research suggests that with some methods, such as restraint in leg-hold traps, changes in the blood chemistry of trapped animals indicate "*stress*" (USDA 1997: 3-81). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

Thus, the decision-making process involves tradeoffs between the above aspects of pain and humaneness. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans if damage management methods were not used. Therefore, humaneness appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of suffering with the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management devices through research and is striving to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some methods are used in those situations when non-lethal damage management methods are not practical or effective.

Minnesota WS personnel are experienced and professional in their use of management methods so that they are as humane as possible under the constraints of current technology and funding. Mitigation /SOPs used to maximize humaneness are listed in Chapter 3. As appropriate, WS euthanizes live animals by methods recommended by the AVMA (AVMA 1986) or the recommendations of a veterinarian, even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife.

Some people are concerned about beaver that drown while restrained by leghold traps and these people consider drowning inhumane. The AVMA (1993) does not recognize drowning as an approved method of euthanasia for companion or research animals. However, these recommendations were designed for domestic terrestrial animals and not wild aquatic rodents which differ behaviorally and biologically. In fact, the AVMA (1993) recognizes that "for wild and feral animals, many of the recommended means of euthanasia for captive animals are not feasible. In field circumstances, wildlife biologists generally do not use the term euthanasia, but use terms such as killing, collecting, or harvesting, recognizing that a distress-free death may not be possible." Trapper education manuals from Minnesota and other wildlife damage management manuals written by wildlife biologists recommend drowning sets for leghold traps set for beaver (Boggess and Loegering, Bromley et al. 1994, Dolbeer et al. 1994, Howard et al.1980, Miller and Yarrow 1994, Randolph 1988). In summary, the AVMA did not intend to make the decision which methods of euthanasia are appropriate for feral or wild animals, yet some animal activist organizations are choosing to apply AVMA guidelines to feral and wild animals.

There has been much controversy whether drowning is euthanasia. The debate centers around an uncertainty as to whether the drowning animals are rendered unconscious by high levels of CO_2 and are thus insensitive to distress and pain (Ludders et al. 1999). Death by drowning in the classical sense is caused by the inhalation of fluid into the lungs and is referred to as "wet" drowning (Gilbert and Gofton 1982, Noonan 1998). Gilbert and Gofton (1982) reported that all submerged beaver do not die from wet drowning, but die of CO_2 induced narcosis, and the AVMA has stated the use of CO_2 is acceptable (Gilbert and Gofton 1982, Noonan 1998). However, Gilbert and Gofton (1982) have been criticized because levels of carbon dioxide in the blood were not reported (Ludders et al. 1999) and there was insufficient evidence

that the beaver in their study were under a state of CO_2 narcosis when they died (V. Nettles, Southeastern Cooperative Wildlife Disease Study, letter to W. MacCallum, Massachusetts Division of Fisheries and Wildlife, June 15, 1998). Adding to the controversy, Clausen and Ersland (1970) did measure CO_2 in the blood for submersed restrained beaver, yet none of the beaver in their study died, so Clausen and Ersland (1970) could not determine if beavers die of CO_2 narcosis.

The use of drowning trap sets has been a traditional wildlife management technique in trapping aquatic mammals such as beaver. In some situations drowning trap sets are the most appropriate and efficient method available to capture beaver. For example, a drowning set attachment should be used with leghold traps when capturing beaver to prevent the animal from injuring themselves while restrained, or from escaping (Miller and Yarrow 1994). Animals that drown die relatively quickly (e.g., within minutes) versus the possible stress of being restrained and harassed by people, dogs, and other wildlife before being euthanized. Drowning sets make the captured animal and trap less visible and prevent human injury (i.e., bites and scratches) to people who may otherwise approach a restrained animal. Furthermore, some people are offended seeing dead animals and drowning takes the dead animal out of public view. Some sites may be unsuitable for body-grip traps or snares because of unstable banks, deep water, or a marsh with muck bottom, but these sites would be suitable for leghold traps.

2.2.7 Impacts to stakeholders, including aesthetics.

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (e.g., wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (e.g., reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (e.g., ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

IWDM provides relief from damage or threats to public health or safety to people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats to public health or safety caused by beaver insist upon their

removal from the property or public location when they cause damage. Some people have an idealistic view and believe that all wildlife should be captured and relocated to another area to alleviate damage or threats to public health or safety. Some people directly affected by the problems caused by wildlife strongly support removal. Individuals not directly affected by the harm or damage may be supportive, neutral, or totally opposed to any removal of wildlife from specific locations or sites. Some people totally opposed to beaver damage management want WS to teach tolerance for damage and threats to public health or safety, and that wildlife should never be killed. Some of the people who oppose removal of wildlife do so because of human-affectionate bonds with individual wildlife. These human-affectionate bonds are similar to attitudes of a pet owner and result in aesthetic enjoyment.

Minnesota WS only conducts beaver damage management at the request of the affected home/property owner or resource manager. If WS received requests from an individual or official for beaver damage management, WS would address the issues/concerns and consideration would be made to explain the reasons why the individual damage management actions would be necessary. Management actions would be carried out in a caring, humane, and professional manner.

2.3 ADDITIONAL ISSUES USED TO DEVELOP MITIGATION MEASURES

2.3.1 Cultural Resources Concerns

The National Historic Preservation Act of 1966, as amended, requires federal agencies to evaluate the effects of any federal undertaking on cultural resources and to consult with appropriate American Indian Tribes to determine whether they have concerns for cultural properties in areas of these federal undertakings. The Native American Graves and Repatriation Act of 1990 provides for protection of American Indian burial sites, human remains, funerary objects and sacred objects, and establishes procedures for notifying Tribes of any new discoveries.

In most cases, beaver damage management has little potential to cause adverse effects to sensitive cultural resources. The areas where damage management would be conducted are small and pose minimal ground disturbance. The Minnesota Historic Preservation Office (MHPO) has reviewed the program as proposed and concluded " no properties for or listed on the national Register of Historic Places will be affected by this project" (B. Bloomberg, MHPO, letter to J. Hart, WS March 2, 2001). Mitigation to avoid impacts to are listed in Chapter 3.

In consideration of American Indian cultural and archeological interests, the Minnesota WS program provided a copy of this pre-decisional EA to all the tribes in Minnesota. This includes four Dakota communities (Prairie Island Mdewakanton Sioux Community, Shakopee-Mdewakanton Sioux Community, Lower Sioux Community, Upper Sioux Community) and seven Anishinaabe reservations (Bois Forte, Fond du Lac, Grand Portage, Leech Lake, Mille Lacs, White Earth and Red Lake).

2.3.2 Environmental Justice and Executive Order 12898 - *"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"*

Environmental Justice (EJ) has been defined as the pursuit of equal justice protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. Fair treatment implies that no person or group should endure a disproportionate share of the negative environmental impacts resulting from this country's domestic and foreign policies or programs. Executive Order 12898 requires federal agencies to make EJ part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies and activities on minority and low-income persons or populations. APHIS plans to implement Executive Order 12898 principally through the provisions of NEPA.

WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898 to insure EJ. WS personnel use wildlife damage management methods as selectively and environmentally conscientiously as possible. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations. In contrast, WS beaver damage management may provide for a safer environment for minority or low-income persons by reducing public health and safety risks.

2.3.3 Protection of Children from Environmental Health and Safety Risks (Executive Order 13045).

Children may suffer disproportionately from environmental health and safety risks for many reasons, including their development of physical and mental status. Because WS makes it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children, WS has considered the impacts that this proposal might have on children. The proposed beaver damage management would occur by using only legally available and approved methods where it is highly unlikely that children would be adversely affected. For these reasons, WS concludes that it would not create an environmental health or safety risk to children from implementing this proposed action. In contrast, WS beaver damage management may provide for a safer environment for children by reducing public health and safety risks.

2.4 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.4.1 WS's Impact on Biodiversity.

No Minnesota WS beaver damage management is conducted to eradicate a native wildlife population. WS operates according to international, federal, and state laws and regulations enacted to ensure species viability. In addition, any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. The impacts of the current WS program on biodiversity are minor and not significant nationwide, statewide, or regionwide (USDA 1997). WS operates on a relatively small percentage of the land area of the State (see Section 1.4), and the WS take of any wildlife species analyzed in this EA is a small proportion of the total population and insignificant to the viability and health of the population (see Section 4.3).

2.4.2 Possible effects on wetlands from removing beaver dams

Some people are concerned that the removal or breaching of beaver dams from an area will result in the loss of wetlands.

Beaver dams are constructed from natural materials, such as logs, sticks, leaves and mud, that beaver gather from the surrounding area. When beaver dams are removed to reduce flood waters and maintain existing stream channels and drainage patterns, these materials are dislodged and returned to the surrounding area. Beaver dam removal events conducted by WS either manually or using explosives are virtually identical to natural phenomena that can occur during heavy rains. During these natural events, large quantities of water flow through beaver impoundment's and frequently the dams are washed out and the dam material is returned to surrounding area. Beaver dam breaching by hand or with binary explosives does not affect the substrate or natural course of the stream but merely returns the area to its preexisting condition with similar flows.

WS removal of beaver dams in Minnesota is exempted from U.S. Army Corps of Engineers wetland protection laws since only beaver placed materials are removed and the original cross section of the stream is not altered. (C. Hauger, USACE, letter to J. Hart, WS, January 17, 2001).

Beaver dam removal is also exempted from the Minnesota Wetland Protection Act (M.S. 103G.2241 and MN Rule 8420.0115 - 8420.0122, Wetland Conservation Act Exemptions Section B5, Items A and D).

2.4.3 No wildlife damage management at taxpayer expense; wildlife damage management should be fee based.

All operational WS beaver management activities are 100% cooperator funded.

2.4.4 Beaver damage should be managed by trappers and nuisance wildlife control agents

The jurisdiction for managing most resident wildlife rests with the MDNR. Currently, MDNR manages beaver as furbearers. Historically, the MDNR, through season and bag limit regulation and trapping method restrictions, has used private fur trapping as the main tool in beaver population management in Minnesota.

Private fur trappers provide a societal service by trapping beaver that are causing damage to public and private property. However, the number of private fur trappers has declined in recent years. According to data from the MDNR, the number of trapping licenses sold declined from a peak of 23,679 in the 1981-82 season to 6-7,000 in recent years (B. Berg, MDNR, pers. commun.). The number of private fur trappers in Minnesota fluctuates according to several factors, including pelt price, weather, furbearer populations and local economic conditions. There is a strong correlation between pelt price and beaver harvest (MDNR 2000). In Minnesota, average beaver pelt prices exceeded $30.00/pelt in 1979. Average beaver pelt price in 1999 - 2000 was $11.26/pelt. Depressed fur prices are at least partially responsible for declining numbers of trappers in recent years. As early as 1993, the MDNR recognized that public harvest through trapping would likely be unable to manage beaver populations in the state (MDNR 1993).

Although private fur trappers may remove many damage-causing beaver during the open beaver season (late October-early May), many beaver problems occur outside the normal beaver season. Many beaver damage problems also occur in urban or developed areas where little or no private beaver trapping occurs.

In response to property damage, trappers and landowners are allowed to conduct beaver removal under a special beaver permit from the MDNR outside the open beaver season. Private fur trappers may not be willing to trap beaver outside the regular beaver season, because pelts taken during this period lack primeness and are of little or no economic value (Jensen et. al 1999). Most private trappers cannot afford to provide year-around, site-specific beaver damage management, however that option remains open to landowners and others experiencing damage.

Site-specific damage management has been necessary to protect property, roads, bridges, and agricultural and natural resources. It is the policy of WS to provide professional damage management upon request, verification of damage at site-specific locations, and cooperator funding. Typically, damage management involves removing a small number of beaver and/or dams from a localized area. WS is not involved in statewide or large scale beaver population reduction (See Section 1.4). Targeted beaver populations include those found near damage sites (i.e., site-specific areas, such as bridges, critical wildlife habitat, managed forests and ornamental trees and shrubs).

Some landowners may prefer that a government agency trap beaver instead of using private trappers or nuisance wildlife control agents, and large landowners with numerous damage sites (i.e., paper companies or highway departments) may prefer to use WS because of reduced administrative burden. Some landowners may prefer to use private trappers or nuisance wildlife control agents instead of WS. WS conducts beaver removal activities at the request of the property owner or manager. These property owners and managers are not required to use the services that are available from WS and may choose to

use private trappers to conduct beaver removal activities if they so desire. In some situations, such as when damage is minor and the fur season is open, WS recommends the use of private fur trappers to remove beaver. Thus, WS beaver damage management activities would not eliminate opportunities for private trappers or nuisance wildlife control agents.

2.4.5 Relocation of wildlife should be used

Relocation of problem wildlife species is a technique that is sometimes used to alleviate wildlife damage problems. The success of a relocation effort, however, depends on the potential for the problem individuals to be captured efficiently and the existence of an appropriate relocation site (Nielsen 1988). While relocation may be appropriate in some situations when the species population is low, beaver are relatively abundant in much of the suitable habitat in Minnesota and relocation is not necessary for the maintenance of viable populations. Because beaver are relatively abundant in Minnesota, beaver relocated into suitable habitat are very likely to encounter other beaver with established territories. Beaver are highly territorial and the newly introduced beaver, which are disoriented and at a disadvantage, are often viciously attacked and sometimes killed from these encounters (McNeely 1995).

Relocated beaver may also disperse long distances from the release site (Novak 1987*a*). Hibbard (1958) in North Dakota recorded an average dispersal distance by 17 relocated beaver to be about 9 miles and Denney (1952) in Colorado reported an average dispersal of 10.4 miles and a maximum dispersal of 30 miles for 26 transplanted beaver. Beaver relocated on streams and later recaptured (N=200) moved an average distance of 4.6 miles, and in lake and pothole relocations (N=272) moved an average of 2 miles (Knudsen and Hale 1965). Only 12% of beaver relocated on streams and 33% of beaver relocated in the lake and pothole areas remained at the release site (Knudsen and Hale 1965).

The relocation of beaver that are causing damage could result in damage problems at the release site or dispersal site. In this case, the original damage problem has simply been shifted from one property to another. If WS relocated the problem animal, WS would be liable for any subsequent damage caused by that animal.

Live-trapping and relocating beaver is not cost-efficient and is biologically unsound (Wade and Ramsey 1986). The AVMA, the National Association of State Public Health Veterinarians, and the Council of State and Territorial Epidemiologists all oppose the relocation of mammals because of the risk of disease transmission, particularly for small mammals (Center for Disease Control 1990). Additionally, the survival of relocated animals is generally very poor due to the stress of relocation, so that in many cases an animal is released only to suffer mortality in a new environment (Craven 1992). Courcelles and Nault (1983) found that 50% (N=10) of radio-collared, relocated beaver died, probably from stress or predation resulting from the relocation. Among animal advocacy groups there appears to be disagreement about relocating wildlife to alleviate damage. The People for the Ethical Treatment of Animals opposes relocation of problem beaver because they believe relocation is cruel (Redmon 1999, 2000). The Humane Society of the United States believes relocation is preferable to death, in some circumstances, but relocation could be stressful and result in suffering or death (Bridgeland et al. 1997).

WS did not consider this option in detail because of the unavailability of appropriate release sites for beaver, and biological and humaneness concerns related to poor survivorship of relocated animals, competition with established colonies, and the potential for transmission of disease between populations. There is a high probability that damage problems would be transferred from one site to another through relocation of beaver.

2.4.6 Live-capture and euthanasia only.

Live-capture and euthanasia of beaver may be used as part of the IWDM approach to reduce aquatic rodent damage. Snares or Hancock traps would be used to live-capture beaver. While snares and Hancock traps

are an effective and at times an efficient tool for capturing beaver, the use of additional methods (e.g., body-grip traps, shooting, leg-hold traps) could be necessary to reduce damage in a cost-effective manner.

2.4.7 Breaching of dams or use of water control structures without beaver removal.

This issue addresses attempts to alleviate flooding damage by controlling the water level at the site without removing the beaver. Dams would either be breached manually or with binary explosives, but these methods are usually ineffective because beaver will quickly repair or replace the dam (McNeely 1995). Installing and maintaining water control structures or removing beaver dams on a daily or weekly basis may be cost prohibitive, and would not alleviate damage from gnawing or felling of trees.

Water control devices and pond levelers have been used for many years in many different states, with varying degrees of success. Various types of beaver pond levelers have been described (Arner 1964, Laramie and Knowles 1985, Lisle 1996, Roblee 1984) and installation of beaver pond levelers can be effective in reducing flooding in certain situations (Minn. Dept. Nat. Res. 1997, Miller and Yarrow 1994, Organ et al. 1996). Pond levelers are not suitable for all applications, in New York they could only be used at 3% of damage sites and required proper installation and continued maintenance to be effective. (Jensen et. al 1999). Even if installed and maintained properly, beaver can build dams immediately downstream of the leveler and raise the water back over the leveler to original damage levels. According to the Minnesota DNR, the Clemson beaver pond leveler works best at road culverts, beaver dams on small streams and water level control structures. The leveler is unsuited for situations when the normal water flow exceeds the capacity of one or more levelers; in large watersheds; where multiple beaver dams exist and the drop in elevation is slight; where water surges violently; or at the outlet of a lake where moving ice in the spring will damage the intake device. Likewise, a leveler may not work where there are extensive drainage ditch systems and large agricultural fields (MDNR 1997). Initial costs of installing and maintaining levelers may prohibit their use at some sites. First year installation and maintenance costs were found to be $1,542 per site in New York (Jensen et. al 1999).

The Beaver Deceiver is a relatively recent water control system that attempts to quiet, calm, and deepen the water around culverts (to reduce the attractiveness to beaver) and exclude beaver from a wide area around the upstream opening of the culvert (Lisle 1996). However, the effectiveness of this method is theoretical and has not been evaluated. Fur trapping is an integral part of and justification for using beaver deceivers. Fur trapping keeps beaver populations at acceptable levels by minimizing flooding and road damage (Lisle 1996). Preservation of the fur resource for recreational trapping is the benefit of using beaver deceivers (Lisle 1996).

WS could implement the use of water control devices as part of an integrated beaver management program at appropriate sites. The Maine WS program installed over 160 water control devices in 1998. The primary benefit of the use of these devices in Maine is to minimize flooding damage while leaving beavers for fur trappers to remove during the regulated trapping season each year (USDA 2000). In Mississippi, the WS program commonly installs water control devices at sites where the landowner intends to hunt ducks or lease duck hunting rights on his land (USDA 2000). Because there are few fur trappers in Mississippi, it is generally necessary to suppress local beaver populations annually at the site to maintain the effectiveness of the device (USDA 2000). Thus, in both Maine and Mississippi, the use of water control devices is supplemented by the continual removal of beaver from the site and an additional benefit is received which helps to justify the expense (i.e. reserving beaver for the fur harvest, providing duck hunting sites). Also, the construction, installation, and maintenance costs of water control devices in Maine and Mississippi are funded, in part, by sources such as state wildlife agencies, county governments, USFWS, or private organizations (USDA 2000). Without such financial assistance and the existence of additional benefits, water control devices may be cost prohibitive at most damage sites.

2.4.8 Appropriateness of Preparing an EA (Instead of an EIS) For Such a Large Area.

Some individuals might question whether preparing an EA for an area as large as the State of Minnesota would meet the NEPA requirements for site specificity. If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA analyzing impacts for the entire state may provide a better analysis than multiple EA's covering smaller zones. In addition, Minnesota WS only conducts beaver damage management in a very small area of the State where damage is occurring or likely to occur (see Section 1.4) and damage may occur anywhere in the State (see Section 1.10.5).

2.4.9 Effects on Regulated Beaver Harvest

Some individuals are concerned that WS beaver removal activities may negatively effect their opportunity to harvest beaver throughout the state. These individuals are concerned that WS would take beaver that would no longer be available for harvest during the state regulated trapping season. WS removal activities would not likely affect the beaver harvest in the state since the overall number of beavers removed by WS are relatively small when compared to the statewide beaver fur harvest by private trappers (Table 4-1).

Localized beaver populations in state-right of ways and on public properties where the public may remove beaver during the trapping season may be removed by WS upon request of the land manager and persons trapping these localized populations may be affected by WS beaver removal efforts. However, if these individuals look elsewhere there would be ample opportunity to harvest beaver on public property in other nearby areas. Furthermore, WS conducts beaver removal activities at the request of the property owner or manager. These property owners and managers are not required to use the services that are available from WS and may choose to use private trappers to conduct beaver removal activities if they so desire. In some situations, such as when damage is minor and the fur season is open, WS recommends the use of private fur trappers to remove beaver.

CHAPTER 3: ALTERNATIVES

3.0 INTRODUCTION

This chapter consists of seven parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the Proposed Action, 3) beaver damage management approaches used by WS, 4) beaver damage methods authorized for use or recommended, 5) methodologies recommended but deemed impractical, ineffective, or unsafe at the present time, 6) a description of alternatives considered, but eliminated from detailed analysis, and 7) a table of mitigation measures and SOP's. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), *"Methods of Control"* (USDA 1997 Appendix J) and the *"Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program"* (USDA 1997, Appendix P) of USDA (1997). Five alternatives were recognized, developed, and analyzed in detail; four alternatives were considered but not analyzed in detail with supporting rationale. The five alternatives analyzed in detail are:

- Alternative 1 - No WS Beaver Damage Management in Minnesota. This alternative would result in no assistance from WS in reducing beaver damage in Minnesota. WS would not provide technical assistance or operational damage management services.

- Alternative 2 - Only Lethal Beaver Damage Management. Under this alternative, only lethal operational damage management and technical assistance would be provided by WS.

- Alternative 3 - Integrated Beaver Damage Management for all public and private land (No Action/Proposed Action). This alternative is the current MN WS beaver damage management program and is the proposed action. Under this alternative lethal and non-lethal operational damage management and technical assistance would be provided by WS.

- Alternative 4 - Technical Assistance Only. Under this alternative, WS would not conduct operational beaver damage management in Minnesota. The entire program would consist of technical assistance.

- Alternative 5 - Non-lethal Beaver Damage Management. Under this alternative, only non-lethal operational damage management and technical assistance would be provided by WS.

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

3.1.1 Alternative 1. No WS Beaver Damage Management in Minnesota.

This alternative would result in no assistance from WS in reducing beaver damage in Minnesota. WS would not provide technical assistance or operational damage management services. All requests for beaver damage management would be referred to the MDNR, local animal control agencies, or private businesses or organizations. Assistance may or may not be available from any of these entities.

3.1.2 Alternative 2. Only Lethal Beaver Damage Management

Under this alternative, only lethal operational beaver damage management and technical assistance would be provided by WS. Requests for information regarding non-lethal management approaches would be referred to MDNR, local animal control agencies, or private businesses or organizations. Individuals or agencies might choose to implement WS lethal recommendations, implement non-lethal methods or other methods not recommended by WS, contract for WS lethal damage management services, use contractual services of private businesses, use volunteer services, or take no action.

3.1.3 Alternative 3. Integrated Beaver Damage Management for all Private and Public Land (No Action and Proposed Action).

Wildlife Services proposes to administer and continue the current beaver damage management program in the State of Minnesota. An IWDM approach would be implemented to reduce damage associated with beaver activities to property, agricultural and natural resources, and public health and safety on all lands in Minnesota where a need exists and a request is received. Damage management would be conducted on property in Minnesota when the resource owners (property owners) or managers request assistance to alleviate beaver damage. An IWDM strategy would be recommended and used, encompassing the use of practical and effective methods of preventing or reducing damage while minimizing harmful effects of damage management measures on humans, other species, and the environment. Under this action, WS would provide technical assistance and operational damage management, including non-lethal and lethal management methods by applying the WS Decision Model (Slate et al. 1992). When appropriate, physical exclusion or habitat modification could be recommended and utilized to reduce beaver damage. In other situations, beaver would be removed as humanely as possible using: body-grip (e.g., Conibear-type) traps, snares, leg-hold traps, and shooting. When appropriate and necessary, beaver dams would be breached using binary explosives or by hand In determining the damage management strategy, preference would be given to practical and effective non-lethal methods. However, non-lethal methods may not always be applied as a first response to each damage problem. The most appropriate response could often be a combination of non-lethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy. Beaver damage management would be conducted in the State, when requested, on private or public property after an *Agreement for Control* or other comparable document has been completed and cooperator funding has been secured. All beaver damage management would be consistent with other uses of the area and would comply with appropriate federal, state and local laws.

3.1.4 Alternative 4 - Technical Assistance Only.

This alternative would only allow Minnesota WS to provide technical assistance to individuals or agencies requesting beaver damage management in Minnesota. Property owners and land mangers could implement their own beaver damage management program, use contractual services of private businesses, use volunteer services, or take no action. This alternative would place the immediate burden of operational damage management work on property owners and other federal, state, or county agencies. Individuals experiencing beaver damage would, independently or with Minnesota WS recommendations, carry out and fund damage management activities.

3.1.5 Alternative 5 - Non-lethal Beaver Damage Management.

Under this alternative, only non-lethal management approaches would be used or recommended by WS. Both non-lethal operational damage management services and technical assistance would be provided by WS. Requests for information regarding lethal management approaches would be referred to MDNR, local animal control agencies, or private businesses or organizations. Individuals or agencies might choose to implement WS non-lethal recommendations, implement lethal methods or other methods not recommended by WS, contract for WS non-lethal damage management services, use contractual services of private businesses, use volunteer services, or take no action.

3.2 BEAVER DAMAGE MANAGEMENT STRATEGIES AND METHODOLOGIES USED BY WS.

Wildlife damage management is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife (USDA 1997). The wildlife damage management approaches used by WS are described below:

3.2.1 Integrated Wildlife Damage Management

During more than 80 years of resolving wildlife damage problems, WS has considered, developed, and used numerous methods of reducing damage problems (USDA 1997). WS's efforts have involved the research and development of new methods, and the implementation of effective strategies to resolve and prevent wildlife damage.

Usually, the most effective approach to resolving wildlife damage is to integrate the use of several methods simultaneously or sequentially. IWDM is the implementation and application of safe and practical methods for the prevention and reduction of damage caused by wildlife based on local problem analyses and the informed judgment of trained personnel. The WS Program applies IWDM, commonly known as Integrated Pest Management (WS Directive 2.105), to reduce damage through the WS Decision Model (Slate et al. 1992) discussed on page 3-5.

The philosophy behind IWDM is to implement effective management techniques in a cost-effective manner while minimizing the potentially harmful effects to humans, target and non-target species, and the environment. IWDM draws from the largest possible array of options to create a combination of techniques for the specific situations. IWDM may incorporate cultural practices, habitat modification, animal behavior modification, removal of individual animals, local population reduction, or any combination of these, depending on the characteristics of the specific damage problems.

3.2.2 Integrated Beaver Damage Management Strategies used by WS consist of:

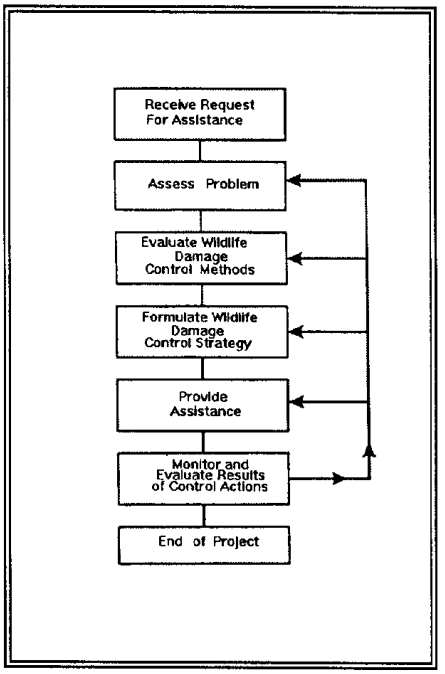
- **Technical Assistance Recommendations** (management decision and implementation is the responsibility of the requester): WS personnel provide information, instructional and educational sessions, demonstrations and advice on available beaver damage management techniques. Technical assistance includes demonstrations on the proper use of damage reduction devices (body-grip traps, leg-hold traps, tree-wraps, etc.) and information on water-level control devices, wildlife habits and biology, habitat management, and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. Bulletins and leaflets on beaver biology could be sent to requesters to inform them about aesthetic values of beaver, types of damage and damage management methods. Generally, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on factors such as need and practical application. WS considers the biology and behavior of the damaging species, and other factors using the WS Decision Model (Slate et al. 1992). Technical assistance may require substantial effort by WS personnel in the decision making process, but the management decision and the actual damage reduction work is the responsibility of the requester.

  Education is an important element of WS's program activities because wildlife damage management is about finding "balance" or coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature has no balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to farmers, homeowners, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are updated on recent developments in damage management technology, laws and regulations, and agency policies.

- **Operational Damage Management Assistance** (management conducted or supervised by WS personnel): Operational damage management assistance is implemented by WS when the problem cannot be resolved through technical assistance and when WS operational management assistance is requested, appropriate and cooperator funded. The initial investigation explores and defines the nature and history of the problem, extent of damage, and the species responsible for the damage. Professional skills of WS personnel are often required to resolve problems effectively and safely, especially if restricted pesticides are required or if the problem requires the direct supervision of a wildlife professional. WS considers the biology and behavior of the damaging species, and other factors using the WS Decision Model (Slate et al. 1992).

3.2.3 WS Decision Making

The procedures used by WS personnel to determine management strategies or methods applied to specific damage problems can be found in USDA (1997 Appendix N).



The WS Decision Model (Figure 3-1) considers the following factors before selecting or recommending damage management methods and techniques:

- Species responsible for the damage
- Magnitude, geographic extent, frequency, historical damage and duration of the problem
- Status of target and non-target species, including T&E species
- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions
- Costs of damage management option [1]

The decision making process is a procedure for evaluating and responding to damage complaints. WS personnel are frequently contacted after requesters have tried non-lethal techniques and found them to be inadequate for reducing damage to an acceptable level. Personnel assess the problem, methods are evaluated for their availability (legal and administrative) and suitability based on biological, economic and social considerations. Following this evaluation, the methods deemed to be practical for the situations are formed into a management strategy. After the management strategy has been implemented, monitoring and evaluation of the strategy is conducted to assess the effectiveness of the strategy. If the strategy is effective, the present need for management is ended.

When damage continues intermittently over time, WS personnel and the requester monitor and reevaluate the situation. If one method or a combination of methods fail to stop damage, a different strategy is implemented. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results, with the damage management strategy reevaluated and revised periodically if necessary.

[1] The cost of management may sometimes be secondary because of overriding environmental, legal, public health and safety, animal welfare or other concerns

3.2.4 Local Decision Making Process

The WS program in Minnesota follows the "Co-managerial approach" to solve wildlife damage or conflicts as described by Decker and Chase (1997). Within this management model, WS provides technical assistance regarding the biology and ecology of beaver and effective, practical, and reasonable methods available to the local decision maker(s) to reduce wildlife damage. This includes non-lethal and lethal methods. Technical assistance on alleviating damage caused by beaver is also available from MDNR. WS and other state and federal wildlife or wildlife damage management agencies may facilitate discussions at local community meetings when resources are available, and make recommendations. Resource owners and others directly affected by beaver damage or conflicts in Minnesota have direct input into the resolution of such problems. They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies, local animal control agencies, or private businesses or organizations. Local decision makers have the final decision on which available (legally and administratively) methods would be used to solve a wildlife-people conflict. They may also compare the benefits versus the damage when deciding which methods would be implemented. Local decision makers must also weigh the cost of implementing each methodology or a series of methodologies. These decision makers include community leaders, private property owners/managers, and public property owners/managers.

3.3 BEAVER DAMAGE MANAGEMENT METHODS AUTHORIZED FOR USE OR RECOMMENDED BY WS

USDA (1997 Appendix J) describes methods currently used by the WS program. Several of these were considered in this assessment because of their potential use in reducing beaver damage to roads and railroads, property, natural and agricultural resources, and public health and safety. A listing and more detailed description of the methods used by Minnesota WS for beaver damage management is found in Appendix C of this EA.

3.3.1 Non-lethal Beaver Damage Management Methods:

Habitat Management generally refers to riparian vegetation manipulation to reduce the carrying capacity for beaver. This would involve the removal of all woody and aquatic vegetation to eliminate beaver food resources. However, this would be an extreme and impractical method in most situations. Habitat management may also involve manipulating beaver impoundment water levels to reduce damage or conflict caused by flooding. Water-level control devices are installed to regulate the volume of water and can be effective in reducing flooding in certain situations (MDNR 1997). Water-level control devices are also utilized as a means of exclusion at road culverts.

Exclusion (tree wraps, fencing) involves preventing beaver from gaining access to protected resources.

Beaver Dam Breaching involves the removal of debris deposited by beaver that impedes the flow of water. This debris would be removed either with the use of binary explosives, mechanically or by hand.

Repellents involve application of a substance to a resource (in this case trees) to protect it from damage. The only repellent registered to reduce gnawing, nibbling and chewing from beaver is a product called Ropel®. Also, recent research from the USDA, APHIS, WS, National Wildlife Research Center has suggested that painting trees with a mixture of 1 quart of sand to 1 gallon of exterior latex paint may prevent beaver from gnawing and cutting the painted trees. While use of these products could protect individiual trees from damage caused by chewing, they do nothing to address the damage that beaver can cause to trees and other resources by flooding.

3.3.2 Lethal Damage Management Methods:

These methods involve damage management specifically designed to lethally remove beaver in certain situations to a level that stabilizes, reduces, or eliminates damage. The amount of removal necessary to achieve a reduction of beaver damage varies according to the resource protected, habitat, species population, the effectiveness of other damage management strategies, and other population factors.

Shooting is selective for the target species and may involve the use of either a shotgun or rifle.

Body-grip (e.g., Conibear) traps are traps designed to cause the quick death of the animal that activates the trap. The appropriate size trap would be used for beaver (generally Conibear 330) and are used in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface. **Leg-hold traps** can be effectively used to capture a variety of mammals. Although beaver could be live-captured by this method, all beaver would be euthanized. Effective trap placement and adjustment and the selection and the placement of appropriate lures by trained WS personnel contribute to the leg-hold trap's selectivity.

Snares are live-capture devices consisting of a cable loop and a locking device and are placed in travel ways. Most snares are also equipped with a swivel to minimize cable twisting and breakage. Beaver live-captured in snares would be euthanized. Non-target species would be released.

Hancock traps (suitcase/basket type cage traps) are designed to live-capture beaver. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The trap's appearance is similar to a large clam when closed. When set, the trap is opened to allow an animal to enter the *clam shells*, when tripped the *clam shells* close around the animal. Although beaver could be live- captured by this method, all beaver would be euthanized.

3.4 METHODOLOGIES CONSIDERED BUT DEEMED IMPRACTICAL, INEFFECTIVE, OR UNSAFE AT THE PRESENT TIME:

Harassment Activities - Harassment has generally proven ineffective in reducing beaver damage problems (Jackson and Decker 1993). Destroying beaver dams and lodges without removing resident beaver rarely resolves damage problems as beaver usually rebuild in the same vicinity in a very short time. Also, removal of food supplies to discourage beaver activity is generally not feasible nor ecologically desirable.

Toxicants - No toxicants are currently registered for beaver damage management.

3.5 ALTERNATIVES CONSIDERED BUT NOT IN DETAIL, WITH RATIONALE

3.5.1 Eradication and Suppression

An eradication and suppression alternative would direct all Minnesota WS beaver damage management efforts toward planned, total elimination or suppression of this species.

Eradication of beaver in Minnesota is not supported by Minnesota WS or MDNR. This alternative was not considered in detail because:

- Minnesota WS opposes eradication of any native wildlife species,
- MDNR opposes eradication of any native Minnesota wildlife species,
- The eradication of a native species would be extremely difficult if not impossible to accomplish, and cost prohibitive, and
- Eradication of native species is not acceptable to most members of the public.

Suppression would direct Minnesota WS program efforts toward managed reduction of certain problem wildlife populations or groups. To consider large-scale population suppression as a goal of the Minnesota WS program is not realistic, practical or allowable under present WS policy.

3.5.2 Population stabilization through birth control.

Contraceptive measures for mammals can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immuno-contraception (the use of contraceptive vaccines). These techniques would require that beaver receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of this method would be subject to approval by federal and state agencies.

Chemical sterilants can be classified into one of three types: chemosterilants, immunocontraceptives, and temporary, short term contraceptives. Chemosterilants have been suggested as a means to managing beaver populations (Davis 1961, Arner 1964). Several reproductive inhibitors have been proposed for use in beaver population reduction, including quinestrol (17-alpha-ethynyl-estradiol - 3-cyclopentylether) and mestranol (Gordon and Arner 1976, Wesley 1978). While chemosterilants have been shown to reduce beaver reproduction in controlled experiments, there are no practical, effective methods for distributing chemosterilants in a consistent way to wild, free ranging beaver populations (Hill et al. 1977, Wesley 1978). A review of research evaluating chemically induced and surgically induced reproductive inhibition as a method for controlling nuisance beaver populations is contained in Novak (1987). Although these methods were effective in reducing beaver reproduction by up to 50%, the methods were not practical or were too expensive for large-scale application.

This alternative was not considered in detail because: (1) it would take a number of years of implementation before the beaver population would decline, and, therefore, damage would continue at the present unacceptable levels for a number of years; (2) surgical sterilization would have to be conducted by licensed veterinarians, would therefore be extremely expensive; (3) it is difficult to effectively live trap or chemically capture the number of beaver that would need to be sterilized in order to effect an eventual decline in the population; (4) no chemical or biological agents for contracepting beaver have been approved for use by state and federal regulatory authorities.

As with chemical repellents and toxicants, a reproduction inhibitor could potentially affect non-target wildlife and the environment. Any material would have to be intensively tested and approved for use. Inhibition of reproduction may also affect behavior, physiological mechanisms, and colony integrity (Brooks et al 1980). Additional research is needed before the environmental affects, and affects to populations and individual animals, from reproductive inhibitors are known. Should a technique or chemical become registered for use, it could be incorporated into the IWDM Program in Minnesota.

3.5.3 Compensation for Wildlife Damage Losses

The compensation alternative would direct all Minnesota WS program efforts and resources toward the verification of losses from beaver, and to providing monetary compensation for these losses. Minnesota WS activities would not include any operational damage management or technical assistance.

This option is not currently available to Minnesota WS because WS is directed and authorized by law to protect American agricultural and natural resources, property and public health and safety (Animal Damage Control Act of 1931, as amended; and the Rural Development, Agricultural and Related Agencies Appropriation Act of 1988). Analysis of this alternative in USDA (1997) shows that it has many drawbacks:

- Compensation would not be practical for public health and safety problems,
- It would require larger expenditures of money to investigate and validate all losses, and to determine and administer appropriate compensation,
- Timely responses to all requests to assess and confirm losses would be difficult, and many losses could not be verified,
- Compensation would give little incentive to limit losses through other management strategies,
- Not all resources managers/owners would rely completely on a compensation program and unregulated lethal control would probably continue and escalate,
- Neither Congress nor the State of Minnesota has appropriated funds for a beaver damage compensation program.

3.5.4 Bounties

There are no statewide bounties on beaver in the State of Minnesota, although some townships provide a bounty for private fur trappers to remove beaver within prescribed damage areas. The MDA beaver damage management matching grant program (1994-January 2001) used a form of bounty or "harvest incentive" of $7.50-$15.00 per beaver (1997) removed from damage sites in enrolled areas. The amount paid per beaver was usually not enough to compensate a trapper for their time and expenses, but together with the value of the pelt, this harvest incentive was used to encourage private trappers to remove beaver from damage sites.

Payment of funds for killing beaver (bounties) suspected of causing economic losses is not supported by WS, and Minnesota WS does not have the authority to establish a bounty program. Bounties are not considered because:

- Bounties are generally not effective in reducing damage,
- Circumstances surrounding take of animals is largely unregulated,
- No process exists to prohibit taking of animals from outside the damage management area for compensation purposes

3.6 MITIGATION AND SOPs FOR BEAVER DAMAGE MANAGEMENT

Mitigation and SOPs

Mitigation is any feature of an action that serves to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current WS program, nationwide and in Minnesota, uses many such mitigations and these are discussed in detail in Chapter 5 of USDA (1997). The following mitigations are incorporated into WS's SOPs and Alternatives 2, 3, 4, and 5:

Table 3-1. Mitigation Measures.

MITIGATION MEASURES	ALTERNATIVES				
	1	2	3	4	5
Animal Welfare and Humaneness of Methods Used by WS					
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.		X	X	X	X
The Decision Model (Slate et al. 1992) would be used to identify effective biologically and ecologically sound beaver damage management strategies and their impacts.		X	X	X	X

MITIGATION MEASURES	ALTERNATIVES				
	1	2	3	4	5
Captured non-target animals would be released unless it is determined by the Minnesota WS personnel that the animal would not survive.		X	X		X
The use of traps and snares would conform to current laws and regulations administered by MDNR and Minnesota WS policy.		X	X		X
Where practical, euthanasia procedures approved by the AVMA that cause minimal pain would be used for live animals.		X	X		
The use of newly-developed, proven, non-lethal methods would be encouraged when appropriate.			X	X	X
Safety Concerns Regarding WS' Beaver Damage Management Methods					
The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, would be used to determine beaver damage management strategies.		X	X	X	X
Beaver damage management conducted on public lands would be coordinated with the management agency.		X	X		X
Live traps would be placed so that captured animals would not be readily visible from any road or public area.		X	X		X
Concerns about Impacts of Beaver Damage Management on T&E Species, Species of Special Concern, and Non-target Species.					
WS consulted with the USFWS regarding the nation-wide program and would continue to implement all applicable measures identified by the USFWS to ensure protection of T&E species.		X	X		X
Minnesota WS's take would be considered with the statewide *"Total Harvest"* (Minnesota WS take and fur harvest) when estimating the impact on wildlife species.		X	X		
Management actions would be directed toward localized populations or groups and/or individual offending animals, dependent on the magnitude of the problem.		X	X		X
WS personnel would be trained and experienced to select the most appropriate method for taking targeted animals and excluding non-target species.		X	X		X
WS would initiate informal consultation with the USFWS following any incidental take of T&E Species.		X	X		X

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

Chapter 4 provides information for making informed decisions on the beaver damage management program outlined in Chapter 1, and the issues and affected environment discussed in Chapter 2. This chapter consists of: 1) analysis of environmental consequences, 2) analysis of each alternative against the issues considered in detail, and 3) summary of WS's impacts.

4.1 ENVIRONMENTAL CONSEQUENCES

This section analyzes the environmental consequences using Alternative 3 (the current program) as the no action alternative and therefore will be used as the baseline when comparing the other alternatives to determine if the real or potential impacts are greater, lesser or the same (Table 4-4). The No Action alternative is a procedural NEPA requirement (40 CFR 1502.14(d)) and is a viable and reasonable alternative that could be selected and serves as a baseline for comparison with the other alternatives. The No Action Alternative, as defined here, is consistent with the Council on Environmental Quality (CEQ) (1981).

The following resource values within Minnesota would not be adversely impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These resources will not be analyzed further.

4.1.1 Social and Recreational Concerns are discussed throughout the document as they relate to issues raised during public involvement, and they are discussed in USDA (1997).

4.1.2 Cumulative and Unavoidable Impacts are discussed in relationship to each of the wildlife species and the environmental impacts are analyzed in this chapter. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. Analysis of the Minnesota WS "*takes*" during 1997, 1998, 1999 and 2000, and anticipated future WS take, in combination with other mortality, indicates that cumulative impacts are not adversely affecting the viability and health of populations. It is not anticipated that the WS program would result in any adverse cumulative impacts to T&E species, and beaver damage management activities do not jeopardize public health and safety.

4.1.3 Irreversible and Irretrievable Commitments of Resources: Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the Minnesota WS program produces very negligible impacts on the supply of fossil fuels and electrical energy.

4.2 ISSUES ANALYZED IN DETAIL

This section presents the expected consequences of each alternative on each of the issues analyzed in detail.

4.2.1 Alternative 1. No WS Beaver Damage Management in Minnesota

Effects on beaver. Beaver populations could continue to increase where trapping pressure was low and some populations would decline or stabilize where trapping pressure was adequate. Some resource owners experiencing damage would trap beaver, or hire private trappers, during the legal harvest season. Resource owners may also obtain permits from the MDNR to trap or shoot beaver outside of the regular trapping season, but would receive no guidance from WS regarding these options. Other resource owners experiencing damage may take illegal or unsafe action against local populations of beaver out of frustration of continued damage.

Effects on plants and other wildlife species, including T&E species. In the absence of WS assistance, some resource owners may attempt to trap beaver or hire private trappers with little or no trapping experience. These resource owners or trappers would be more likely than WS personnel to trap non-target species and not report non-target take.

In the absence of WS assistance, other entities are likely to remove beaver dams causing damage. These entities are unlikely to conform to mitigation measures to protect incidental taking of two state listed species; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marsh marigold (*Caltha natans*), state endangered that occur in beaver ponds and associated flowing water (B. Eliason, MDNR, letter to J. Hart, WS, March 16, 2001). WS will conform to these mitigation measures as described to protect these two species from incidental taking.

One anticipated outcome of no WS beaver damage management program, is a likely minor increase in beaver damage and the associated beaver impoundments. These impoundments would likely have the greatest impact on other wildlife and plant species. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative effects of increased beaver impoundments, including affected species, are described in Section 1.3.2.

Effects on public and pet health and safety. If beaver populations continue to increase without a damage management program in place, there are potential threats to public health and safety. For example, flooding of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beaver are also carriers of the intestinal parasite *Giardia lamblia*, which can contaminate water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Additionally, resource owners may attempt to solve beaver damage problems through trapping and shooting without WS expertise, and there could be increased risks to public and pet safety from improper or inexperienced use of damage management methods.

Humaneness of methods to be used. This alternative would be considered humane by many people. Resource/property owners could use lethal and non-lethal methods to reduce beaver damage. In addition, some resource/property owners may take illegal action against localized populations of beaver out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by experienced WS personnel.

Impact to stakeholders, including aesthetics. The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. Resource owners receiving damage from beaver would likely strongly oppose this alternative because they would bear the damage caused by beaver. Animal activists and a minority of environmental activists would prefer this alternative because activists believe it is morally wrong to kill or use animals for any reason. Some people would support this alternative because they enjoy seeing beaver, or having beaver nearby. However, while WS would take no action under this alternative, other individuals or entities could, and likely would, conduct damage management activities.

4.2.2 Alternative 2. Only Lethal Beaver Damage Management

Effects on beaver populations. This alternative could result in a localized decrease in the beaver population at the specific site where the damage management occurs. Even if WS lethally removed beaver at all project sites, it is not anticipated that more than 1,000 beaver would be killed annually by WS. Therefore, the impacts on beaver populations are expected to be similar to those described in Alternative 3. New beaver would likely re-inhabit the site as long as suitable habitat exists. The amount of time until new beaver move into the area would vary depending on the habitat type, time of year, and population densities

in the area. In our experience in Minnesota, some areas are re-colonized by beaver within 6 - 24 months after beaver removal is completed.

Effects on plants and other wildlife species, including T&E species. Non-target species such as otter, muskrat, and raccoons may occasionally be killed during beaver damage management. Turtles may also be caught in some traps, but can generally be released alive.

The Minnesota DNR has identified two state listed plants; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marsh marigold (*Caltha natans*), state endangered, that occur in beaver ponds and associated flowing water and could be negatively impacted by dam removal. The Minnesota DNR has also recommended mitigation measures to protect these species (B. Eliason, MDNR, letter to J. Hart, WS March 16, 2001). WS will conform to these described mitigation methods to protect these two species from incidental taking.

WS impacts on non-target species would be similar to those described in Alternative 3, except for those species that benefit from the removal of beaver dams. If another entity (other than WS) removed those dams, the impacts would be similar to Alternative 3. WS personnel would minimize non-target captures through careful placement of traps or variation in capture methods.

Effects on public and pet health and safety. WS methods of shooting and trapping pose minimal or no threat to public and pet health and safety. All firearm safety precautions are followed by WS when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles would sometimes be used to reduce beaver damage problems when lethal methods are determined to be appropriate. Shooting is selective for target species. WS uses firearms to shoot beaver caught in live traps as humanely as possible. WS' traps are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on properties where traps are set to alert the public of their presence. Body-grip (e.g., Conibear-type) trap sets for beaver are restricted to water sets, which further reduces threats to public and pet health and safety.

Firearm use is very sensitive and a public concern because of safety issues. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

This alternative would reduce threats to public safety by removing beaver from a site, and thus alleviating flooding and burrowing damage to roads and railroads, risks of Giardiasis outbreaks, and possible mosquito borne disease outbreaks.

Humaneness of methods to be used. WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Under this alternative, beaver would be humanely trapped or shot by experienced WS personnel using the best methods available. Beaver live-captured in traps or snares would be euthanized. Some animal activists could perceive these methods as inhumane because they oppose all lethal methods of damage management.

Impacts to stakeholders, including aesthetics. The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. This alternative would likely be favored by resource owners who are receiving damage. Although, some resource owners would be saddened if the beaver were removed. Animal rights activists and a minority of environmental activists would strongly oppose this alternative because they believe it is morally wrong to kill or use

animals for any reason or they believe the benefits from beaver would outweigh the associated damage. The ability to view and aesthetically enjoy beaver at a particular site could be limited if the beaver are removed. New animals, however, would most likely use the site in the future, although the length of time until new beaver arrive is variable, depending on the habitat type, time of year, and population densities of beaver in the area. The opportunity to view beaver is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

4.2.3 Alternative 3 - Integrated Beaver Damage Management for all Public and Private Land (No Action and Proposed Action).

Effects on beaver populations. The current program removes only a very small number of beaver from the statewide Minnesota population (Table 4-1) (see Section 1.3). Unlike Alternative 2, the use of exclusion, habitat modification, water control devices, etc. could be used as part of an IWDM approach. The use of water control devices or the removal of dams would have little or no effect on beaver populations. The amount of time until new beaver move into the area would vary depending on the habitat type, time of year, and population densities in the area. In our experience in Minnesota, some areas are re-colonized by beaver within 6 - 24 months.

Beaver Population Impact Analysis.

The authority for management of resident wildlife species is the responsibility of the MDNR and beaver are classified as protected furbearers. MDNR compiles and provides information to WS on population trends and take, and uses this information to manage beaver populations. Therefore, WS uses the best information available to generate a population estimate of beaver in Minnesota.

Beaver live mostly in family groups that are comprised of 2 adult parents with 2-6 offspring from the current or previous breeding season (Novak 1987). Average family group size has been documented as ranging from 3.0 to 9.2 (Novak 1987). Beaver abundance has been reported in terms of families per kilometer of stream or per square kilometer of habitat. Novak (1987) summarized reported beaver family abundance as ranging from 0.31 to 1.5 families per kilometer of stream, which converts to 0.5 - 2.4 families per mile of stream. The MDNR beaver survey data, expressed in live colonies per mile (LC/M) indicates beaver densities of 0-3.55 LC/M. Densities reported in terms of families per square kilometer have been reported to range from 0.15 to 3.9 (Novak 1987) which is the same as 0.24 to 6.3 per square mile. Novak (1987) indicates that rates of beaver populations are density dependent, which means that rates of increase generally rise as a population is reduced and become less as a population increases toward its carrying capacity[1]. This is a natural function of most wildlife populations that helps to naturally mitigate population reductions. Logan et al. (1996), indicated that wildlife populations being held at a level below carrying capacity can sustain a higher level of harvest because of the compensatory mechanisms that cause higher rates of increase in such populations.

The number of beaver taken by WS and harvested by fur trappers in MN is shown in Table 4-1 (MIS 1997, 1998, 1999, 2000, and MDNR) The FY99 take of 152 beaver was the highest number ever removed in one year by the Minnesota WS program. However, based upon an anticipated increase of work, MN WS expects that no more than 1,000 beavers would be removed annually while conducting WS direct control activities within the state. Therefore, 1,000 beavers was used to analyze potential impacts to the statewide beaver population in Minnesota. The ADC FEIS (USDA 1997) determined using qualitative information (population trend indicators and harvest data) that if WS beaver kill is less than or equal to 33% of the total harvest, the magnitude is considered low. Magnitude is defined as a measure of the number of animals killed in relation to their abundance. Using the harvest data and the annual take of 1,000 beavers by WS, the magnitude is considered extremely low for WS take of beaver in Minnesota.

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[1]Carrying capacity is the maximum number of animals that the environment can sustain and is determined by the availability of food, water, cover, and the tolerance of crowding by the species in question.

Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in the beaver population. MDNR biologists have concurred with WS's finding that WS beaver damage management activities will have no adverse effect on statewide beaver populations (M. Don Carlos, MDNR, letter to J. Hart, WS, February 5, 2001).

Table 4-1. Beaver harvest data for Minnesota, 1997-2000

Beaver Harvest Data	1997	1998	1999	2000
# removed by WS	8	28	152	116
# taken during state regulated harvest season	83,000	94,000	67,000	unavailable at this time
%WS take (% of total take)	0.0001	0.0003	0.0022	unavailable at this time

Effects on plants and other wildlife species, including T&E species. Non-target species, such as otter, muskrat, and raccoons may occasionally be taken during beaver damage management. Turtles may also be caught in some beaver traps, but can generally be released alive. WS personnel would minimize non-target species take with careful placement of traps or variation in capture methods. Table 4-2 provides a summary of the non-target species captured by MN WS in FY 97 to FY 00.

WS does not expect the rate of non-target species take to substantially increase above current program levels and expects the annual take of river otter to be less than 10% of the number of beaver taken by WS. The ADC FEIS (USDA 1997) determined using qualitative information (population trend indicators and harvest data) that if WS take is less than or equal to 33% of the total harvest, the magnitude is considered low. Magintude is defined as a measure of the number of animals killed in relation to their abundance. Using available harvest data and the annual kill by WS, the magnitude is considered extremely low for WS take of otters, raccoons, muskrat and snapping turtles in Minnesota. Thus, cumulative take appears to be far beneath the level that would begin to cause a decline in these populations. Any other non-targets that may incidentally be taken by WS is expected to be minimal (less than 10 individuals per year) and should have no adverse effect on statewide furbearer populations. MDNR has concurred with this finding (M. DonCarlos, MDNR, letter to J. Hart, WS, February 5, 2001).

Additionally, no adverse effects on Federally classified Threatened or Endangered species are expected from this alternative (P. Burke, USFWS, letter to J. Hart, WS, February 28, 2001).

The Minnesota DNR has indicated that WS beaver damage management activities would have no adverse effect on state listed animal species. The MDNR did recommend specific mitigation measures to prevent adverse effects on two state listed species; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marshmarigold (*Caltha natans*), state endangered (B. Eliason, MDNR, letter to J. Hart, WS, March 16, 2001). WS will conform to these mitigation measures as described. None of the remaining 121 state listed plants are expected to be negatively impacted by WS beaver management activities.

One anticipated outcome of this alternative is a slight reduction in beaver damage and associated beaver impoundments. These impoundments would likely have the greatest impact on other wildlife and plant

species. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative effects of increased beaver impoundments, including affected species, are described in Section 1.3.2. The purpose of WS dam removal is to restore a free-flowing condition to streams, and in the long run, T&E species should benefit from this.

Table 4-2. Non-target animals removed by WS during beaver management operations, FY 97-FY 00

Non-target Data	1997	1998	1999	2000
River otter (killed)	0	1	14	1
River otter (freed)	0	0	0	2
# taken during regulated state harvest	2,145	1,946	1,635	not available
% WS take (% of total take)	0.0	0.0005	0.0085	not available
Muskrat (killed)	0	4	4	7
# taken during regulated state harvest	194,000	131,000	97,000	not available
% WS take (% of total take)	0.0	0.000003	0.00004	not available
Snapping turtle (killed)	0	1	2	0
Snapping turtle (freed)	1	2	3	2
# taken during state regulated harvest	2,979	2,770	2,355	not available
% WS take (% of total take)	0.0003	0.0007	0.0013	not available
Raccoon	0	1	0	0
# taken during state regulated harvest	71,000	71,000	41,000	not available
% WS take (% of total take)	0.0	0.000014	0.0	not available

Effects on public and pet health and safety. WS occasionally uses binary explosives to breach beaver dams. WS personnel that use explosives are required to take and pass in-depth training, are certified to use explosives and must be able to demonstrate competence and safety in their use of explosives. They adhere to WS policies as well as regulations from the Bureau of Alcohol, Tobacco and Firearms, the Occupational Safety and Health Administration, and the Department of Transportation with regards to explosives use, storage, and transportation. Binary explosives require two components to be mixed before they can be actuated which virtually eliminates the hazard of accidental detonation during storage and transportation. Storage and transportation of mixed binary explosives is not allowed. When explosives are used, signs are placed to stop public entry. Where dams are near roads, police or other road officials are used to stop traffic and public entry, much like MDOT crews when they use explosives, to ensure public safety. Therefore, no adverse effects to public safety are expected from the use of explosives by WS.

WS methods of shooting and trapping pose minimal or no threat to public and pet health and safety. All firearm safety precautions are followed by WS when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles is sometimes used to reduce beaver damage when lethal methods are determined to be appropriate. Shooting is selective for target species. WS uses firearms to humanely euthanize beaver caught in live traps. WS' traps are strategically placed to minimize exposure to the public and pets. Appropriate signs are posted on all properties where traps are set to alert the public of their presence. Body-grip (e.g., Conibear-type) traps are restricted to water sets, which further reduces threats to public and pet health and safety.

Firearm use is very sensitive and a public concern because of misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who use firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment.*

This alternative would reduce threats to public health and safety by removing beaver from a site, and thus alleviating damage such as flooding and burrowing damage to roads and railroads, risks of Giardiasis outbreaks, and possible mosquito borne disease outbreaks.

Humaneness of methods to be used. WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Under this alternative, beaver would be trapped as humanely as possible or shot by experienced WS personnel using the best method available. Beaver live-captured in traps or snares would be euthanized. Some animal rights activists may perceive this method as inhumane because they oppose all lethal methods of damage management. In addition, this alternative allows WS to consider non-lethal methods, and WS would implement non-lethal methods for beaver damage management when appropriate.

Impacts to stakeholders, including aesthetics. The impacts of this alternative to stakeholders would be variable depending on their values towards wildlife and compassion for their neighbors. This alternative would likely be favored by most resource owners who are receiving damage and by WS as it allows for an IWDM approach to resolving damage problems. An IWDM approach allows for the use of the most appropriate damage management methods. Most stakeholders without damage would also prefer this alternative to Alternative 2, where all beaver are killed because non-lethal methods could be appropriate to resolve damage problems. Some animal activists and a minority of environmental activists would strongly oppose this alternative, and most action alternatives, because they believe it is morally wrong to kill or use animals for any reason or they believe that the benefits from beaver outweigh the associated damage. The ability to view and esthetically enjoy beaver at a particular site could be limited if the beaver are removed. New beaver, however, would likely use the site in the future, although the length of time until new animals arrive is variable, depending on the habitat, time of year, and population densities in

the area. The opportunity to view beaver is available if a person makes the effort to visit sites with adequate habitat outside of the damage management area.

Public reaction would be variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts/problems between humans and wildlife. The IWDM approach, which includes non-lethal and lethal methods as appropriate, provides relief from damage or threats to public and pet health or safety to people who would have no relief from such damage or threats if non-lethal methods were ineffective or impractical. Many people directly affected by problems and threats to public and pet health or safety caused by beaver insist upon their removal from the property or public location when the wildlife acceptance capacity is reached or exceeded. Some people will have the opinion that beaver should be captured and relocated to a rural area to alleviate damage or threats to public and pet health or safety. Some people would strongly oppose removal of the beaver regardless of the amount of damage. Individuals not directly affected by the threats or damage may be supportive, neutral, or totally opposed to any removal of beaver from specific locations or sites. Some people that totally oppose lethal damage management want WS to teach tolerance for beaver damage and threats to public and pet health or safety, and that beaver should never be killed.

4.2.4 Alternative 4 - Technical Assistance Only.

Effects on beaver. Beaver populations could continue to increase over time where trapping pressure was low. Some local populations of beaver could decline or stabilize where trapping pressure was adequate or drought conditions exist. Some resource owners may trap beaver, or hire trappers during the legal harvest season. Resource owners may also obtain permits from the MDNR to allow them to trap or shoot beaver outside of the regular season, but could receive only technical assistance from WS regarding these options. Some resource owners may take illegal or unsafe actions against local populations of beaver out of frustration or ignorance.

Effects on plants and other wildlife species, including threatened and endangered (T&E) species.

In the absence of operational assistance from WS, some resource owners may attempt to trap beaver or hire private trappers with little or no trapping experience. These resource owners or trappers would be more likely than WS personnel to trap non-target species and not report non-target take.

In the absence of WS assistance, other entities are likely to remove beaver dams causing damage. These entities are unlikely to conform to mitigation measures to protect incidental taking of two state listed species; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marsh marigold (*Caltha natans*), state endangered that occur in beaver ponds and associated flowing water (B. Eliason, MDNR, letter to J. Hart, WS, March 16, 2001). WS will conform to these mitigation measures as described to protect these two species from incidental taking.

One anticipated outcome of this alternative, is a likely minor increase in beaver damage and the associated beaver impoundments. These impoundments would likely have the greatest impact on other wildlife and plant species. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative affects of increased beaver impoundments, including affected species, are described in Section 1.3.2.

Effects on public and pet health and safety. If beaver damage continues to increase without implementing damage management, there are potential threats to public health and safety. For example, flooding of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beaver are also carriers of the intestinal parasite *Giardia lamblia*, and can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Beaver flooded areas also create conditions favorable for mosquitos and

increase the potential for transmission of mosquito borne diseases. Additionally, resource owners may attempt to resolve beaver damage problems through illegal use of chemicals/pesticides, trapping, and shooting without WS expertise, and there may be some risk to public and pet health and safety from improper or inexperienced use of these methods.

Humaneness of methods to be used. The issue of humaneness as it relates to WS use of control methods under this alternative is not applicable because resource owners or others would be responsible to implement the damage management methods. Some resource owners may take illegal action against local populations of beaver out of frustration or ignorance. Some of these illegal actions may be less humane than methods used by WS personnel.

Impact to stakeholders, including aesthetics. The impacts of this alternative to stakeholders would vary depending on the damage management efforts employed by resource owners, their values toward wildlife and compassion for their neighbors. Resource owners who are receiving damage from beaver would likely oppose this management alternative. Some people would support this alternative because they believe resource owners would do little to remove beavers. Others would oppose this alternative because they believe resource owners would use illegal, inhumane, or environmentally unsafe control methods. While WS could only provide technical assistance under this alternative, other individuals or entities could conduct damage management without implementing the recommendations of WS.

4.2.5 Alternative 5 - Non-lethal Beaver Damage Management.

Effects on beaver. Under Alternative 5, only non-lethal methods to alleviate damage could be implemented by WS. No beaver would be killed by WS under this alternative. The effects on beaver populations could reduce, stay the same, or increase depending on actions taken by others. Some resource owners may trap beaver, or hire trappers during the legal harvest season. Resource owners may also obtain permits from the MDNR to allow them to trap or shoot beaver outside of the regular season. Beaver populations could continue to increase where trapping pressure was low. Some local populations of beaver would temporarily decline or stabilize where trapping pressure was adequate. Some resource owners may take illegal, unsafe, or environmentally harmful action against local populations of beaver out of frustration or ignorance.

Effects on plants and other wildlife species, including T&E species.
In the absence of an integrated beaver damage management program by WS that includes the option of removal of beaver from damage sites, some resource owners may attempt to trap beaver or hire private trappers with little or no trapping experience. These resource owners or trappers would be more likely than WS personnel to trap non-target species and not report non-target take.

WS would still perform dam removal under this alternative. The Minnesota DNR has indicated that WS beaver damage management activities, including dam removal, would have no adverse effect on state listed animal species. The MDNR did recommend specific mitigation measures to prevent adverse effects on two state listed species; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marshmarigold (*Caltha natans*), state endangered (B. Eliason, MDNR, letter to J. Hart, WS, March 16, 2001). WS will conform to these mitigation measures as described.

One anticipated outcome of this alternative, is a likely minor increase in beaver damage and the associated beaver impoundments. These impoundments would likely have the greatest impact on other wildlife and plant species. The positive effects of beaver activities, including affected species, have been summarized in Section 1.3.1. The negative affects of increased beaver impoundments, including affected species, are described in Section 1.3.2.

Effects on public and pet health and safety. Non-lethal methods, exclusion and habitat modifications, would not be efficient or successful in resolving many beaver damage situations. If beaver populations would continue to increase without implementing lethal damage management, there are potential threats to public health and safety from burrowing, structural damage and disease threats. For example, flooding of roadways and railroad beds can result in serious accidents (Woodward 1983, Miller and Yarrow 1994). Beaver are also carriers of the intestinal parasite *Giardia lamblia*, and can contaminate human water supplies and cause outbreaks of the disease Giardiasis in humans (Woodward 1983, Wade and Ramsey 1986, Miller and Yarrow 1994). Beaver flooded areas also create conditions favorable for mosquitos and increase the potential for transmission of mosquito borne diseases. Washouts or collapse of levees and dikes due to beaver burrowing, and of roads and railroad beds due to beaver flooding, may cause serious accidents or compromise structural stability. Additionally, resource owners may attempt to lethally resolve beaver damage problems through illegal use of chemicals/pesticides, trapping, and shooting without WS expertise, and there may be some risk to public and pet health and safety from improper or inexperienced use of these methods.

WS occasionally uses binary explosives to breach beaver dams. WS personnel that use explosives are required to take and pass in-depth training, are certified to use explosives and must be able to demonstrate competence and safety in their use of explosives. They adhere to WS policies as well as regulations from the Bureau of Alcohol, Tobacco and Firearms, the Occupational Safety and Health Administration, and the Department of Transportation with regards to explosives use, storage, and transportation. Binary explosives require two components to be mixed before they can be actuated which virtually eliminates the hazard of accidental detonation during storage and transportation. Storage and transportation of mixed binary explosives is not allowed. When explosives are used, signs are placed to stop public entry. Where dams are near roads, police or other road officials are used to stop traffic and public entry, much like MDOT crews when they use explosives, to ensure public safety. Therefore, no adverse effects to public safety are expected from the use of explosives by WS.

Humaneness of methods to be used. Under this alternative, only non-lethal beaver damage management methods could be implemented. WS personnel are experienced and professional in their use of management methods, and methods are applied as humanely as possible. Some animal activists may perceive this approach as humane because they oppose all lethal methods of damage management. However, without effective damage management methods available, resource owners may take illegal action against some local populations of beaver out of frustration of continued damage. Some of these illegal actions may be less humane than methods used by WS personnel.

Impact to stakeholders, including aesthetics. The impacts of this alternative to stakeholders would be variable depending on the damage management efforts employed by resource owners, their values toward beaver and compassion for their neighbors. Resource owners who are receiving damage from beaver would likely oppose this management alternative. Some people would support this alternative because they believe resource owners would do little to remove beavers. Others would oppose this alternative because they believe resource owners would use illegal, inhumane, or environmentally unsafe methods. While WS could only provide non-lethal assistance under this alternative, other individuals or entities could conduct lethal damage management.

4.3 SUMMARY OF WS's IMPACTS

Table 4-3 presents a relative comparison of the anticipated impacts of each of the alternatives as they relate to each of the major issues identified in Chapter 2.

4.3.1 Cumulative Impacts

No significant cumulative environmental impacts are expected from any of the alternatives (Table 4-3). With regard to Alternative 2, Lethal Removal Only, and Alternative 3, the Proposed Action, the lethal removal of beaver causing damage would have no adverse affect on beaver populations in the state of Minnesota. No risk to public or pet heath and safety is expected from the proposed alternative. Although some persons would likely oppose lethal removal of beaver, the analysis in this EA indicates that such removals would result in no significant cumulative adverse impacts on the quality of the human environment.

Table 4-3. Cumulative Impacts

Issues/Impacts	Alternative 1: No Program	Alternative 2: Lethal Only	Alternative 3: IWDM Program (Proposed Action/No Action)	Alternative 4: Technical Assistance	Alternative 5: Non-lethal Only
Beaver populations	Populations could increase unless resource owners seek private help.	Possible reduction in local populations, no statewide effect.	Possible reduction in local populations, no statewide effect.	Populations could increase unless resource owners seek private help.	Populations could increase unless resource owners seek private help.
Non-target Species, Including T&E Species	No effects by WS.	No adverse impact to T&E or non- target species populations.	No adverse impact to T&E or non-target species populations.	No effects by WS.	No adverse impact to T&E or non-target species populations.
Public and Pet Safety	Continued risk from flooding, burrowing, and diseases.	No increased threat to safety. Reduction of risks from flooding, burrowing and diseases.	No threat to public and pet safety. Reduction of risks from flooding, burrowing, and diseases.	Continued risk from flooding, burrowing, and diseases.	No increased threat to safety. Reduction of risks from flooding, burrowing, and diseases.
Humaneness of Method	Not applicable because no action by WS.	WS uses the most humane methods available. Some activists would oppose all lethal methods.	WS uses the most humane methods available. Some activists would oppose all lethal methods.	Probably considered more humane by most people than lethal measures.	Probably considered more humane by most people than lethal measures.
Impact to Stakeholders, Including Aesthetics	Variable. Some people prefer this method. Those receiving damage probably oppose this alternative.	Variable. Those receiving damage would probably favor this alternative. Some activists would oppose this alternative.	Variable. Those receiving damage would probably favor this alternative. Some activists would oppose this alternative.	Variable. Some people prefer this method. Those receiving damage probably oppose this alternative.	Variable. Those receiving damage would probably favor this alternative. Some activists would oppose this alternative.

CHAPTER 5: LIST OF PREPARERS

David Reinhold	Environmental Coordinator/Wildlife Biologist, USDA-APHIS-WS, Raleigh, North Carolina.
John Hart	District Supervisor/Wildlife Biologist, USDA-APHIS-WS, Grand Rapids, Minnesota.
William Paul	Assistant State Director/Wildlife Biologist, USDA-APHIS-WS, Grand Rapids, Minnesota.
Duane Sahr	Wildlife Specialist, USDA-APHIS-WS, Grand Rapids, Minnesota.
Constance Timm	Office Support Assistant, USDA-APHIS-WS, Grand Rapids, Minnesota.

LIST OF PERSONS CONSULTED

Bill Berg	Wildlife Research Biologist, Minnesota DNR, Forest Wildlife Research Group, Grand Rapids, Minnesota.
Britta Bloomberg	Deputy State Historic Preservation Officer, Minnesota Historical Society, State Historic Preservation Office, St. Paul, Minnesota.
Perry Bollum	Wetland Enforcement Officer Supervisor, Minnesota DNR, Law Enforcement Division, Cohasset, Minnesota.
Paul Burke	Biologist, U.S. Fish & Wildlife Service, Twin Cities Field Office, Bloomington, Minnesota.
Mike DonCarlos	Research Supervisor, Minnesota DNR, Section of Wildlife, St. Paul, Minnesota.
Bonita Eliason	Supervisor, Natural Heritage and Nongame Research, Minnesota DNR, St. Paul, Minnesota.
Char M. Hauger	Chief, Regulatory Branch, Department of the Army, Corps of Engineers, St. Paul, Minnesota.
Roy Johannes	Commercial Fisheries Supervisor, Section of Fisheries, Minnesota DNR, St. Paul, Minnesota
Roger Lake	Assistant Supervisor, Wildlife Populations and Research Unit, Division of Wildlife, Minnesota DNR

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APPENDIX B
AUTHORITY AND COMPLIANCE

The USDA is directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the WS program is the Animal Damage Control Act of March 2, 1931, as amended (7 U.S. C. 426-426c; 46 Stat. 1468), which provides that:

> *"The Secretary of Agriculture is authorized and directed to conduct such investigations, experiments, and tests as he may deem necessary in order to determine, demonstrate, and promulgate the best methods of eradication, suppression, or bringing under control on national forests and other areas of the public domain as well as on State, Territory or privately owned lands of mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jackrabbits, brown tree snakes and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, furbearing animals, and birds, and for the protection of stock and other domestic animals through the suppression of rabies and tularemia in predatory or other wild animals; and to conduct campaigns for the destruction or control of such animals. Provided that in carrying out the provisions of this Section, the Secretary of Agriculture may cooperate with States, individuals, and public and private agencies, organizations, and institutions."*

Since 1931, with the changes in societal values, WS policies and its programs place greater emphasis on the part of the Act discussing *"bringing (damage) under control", rather than "eradication" and "suppression"* of wildlife populations. In 1988, Congress strengthened the legislative mandate of WS with the Rural Development, Agriculture, and Related Agencies Appropriations Act. This Act states, in part:

> *"That hereafter, the Secretary of Agriculture is authorized, except for urban rodent control, to conduct activities and to enter into agreements with States, local jurisdictions, individuals, and public and private agencies, organizations, and institutions in the control of nuisance mammals and birds and those mammals and birds species that are reservoirs for zoonotic diseases, and to deposit any money collected under any such agreement into the appropriation accounts that incur the costs to be available immediately and to remain available until expended for Animal Damage Control activities."*

Minnesota Department of Natural Resources Authorization

The Commissioner of the Minnesota DNR (MDNR) is authorized by Minnesota Statutes, 1996, Chapters 84 and 97, sections 84.027 and 97A.045, to provide for the control, management, restoration, conservation and regulation of the bird, fish, game, forestry and all wildlife resources of the state.

Memorandum of Understanding (MOU) #9872272754 allows USDA-APHIS-WS to participate in a cooperative wildlife damage management program in Minnesota. This MOU establishes a cooperative relationship between WS, the MDNR, the MDA, the Minnesota Board of Animal Health (MBAH), the Minnesota Department of Health (MDH), and the University of Minnesota Extension Service (UME), for planning, coordinating and implementing wildlife damage management policies to prevent or minimize damage caused by wild animal species (including threatened and endangered species) to agriculture, horticulture, aquaculture, animal husbandry, forestry, wildlife, public health/safety, property, natural resources and to facilitate the exchange of information among the cooperating agencies.

MDNR special permit No. 10275 authorizes WS on an annual basis to take, or take and release protected birds and mammals in reasonable numbers to alleviate animal damage problems. MDNR Law Enforcement issues a special beaver permit to individuals for removal of nuisance beaver outside of the regular beaver trapping season. The permit specifies the lands authorized for trapping, period of time during which trapping is authorized, and the number of beaver that may be taken.

APPENDIX B

National Environmental Policy Act (NEPA)

Environmental documents pursuant to NEPA must be completed before work plans consistent with the NEPA decision can be implemented. WS also coordinates specific projects and programs with other agencies. The purpose of these contacts is to coordinate any wildlife damage management activites tha may affect resources managed by these agencies or affect other areas of mutual concern.

Endangered Species Act (ESA)

It is a federal policy, under the ESA, that all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the Act **[**Sec. 2(c)**]**. WS conducts Section 7 cosultations with the USFWS to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species...Each agency shall use the best scientific and commercial data available"**[**Sec. 7(a)(2)**]**.

APPENDIX C
METHODS USED BY MINNESOTA WS FOR BEAVER DAMAGE MANAGEMENT

Resource owners and government agencies have used a variety of techniques to reduce beaver damage. However, all lethal and non-lethal methods developed to date have limitations based on costs, logistics, or effectiveness. Below is a discussion of beaver damage management methods currently available to the Minnesota WS Program. If other methods are proven effective and legal to use in Minnesota, they could be incorporated into the Minnesota WS program.

NON-LETHAL DAMAGE MANAGEMENT METHODS:

Habitat Management for the reduction of beaver damage refers to vegetation manipulation to reduce the carrying capacity for beaver. Habitat alteration through forest type conversion might be the most effective long-term method of reducing beaver density in some areas (Payne 1989). Forest management practices that discourage the establishment of aspen and promote long-lived hardwoods and conifers within 200 - 400 feet of streams may reduce beaver populations on those streams. Payne (1989) suggested that reduced food availability might force beaver colonies to move more often, however, this movement could increase nuisance complaints.

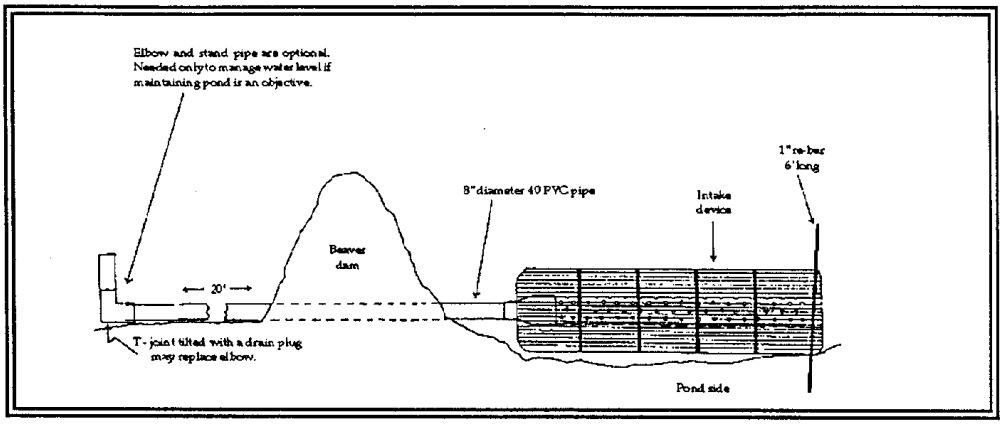
Physical factors may have a greater impact on beaver habitat use than food availability, and habitat alteration may have little effect on beaver populations (Beier and Barrett 1987). Habitat management to reduce or stabilize beaver populations has been a component of beaver management recommendations. Habitat management may also involve manipulating beaver impoundment water levels to reduce damage or conflict caused by flooding. Impoundments can be completely drained by breaching, by hand or with explosives, major dams. Water levels may sometimes also be lowered by use of a drain tube or leveler placed in the dam (Laramie and Knowles 1985, Lisle 1996, Miller and Yarrow 1994, Roblee 1983, Roblee 1984, Roblee 1987) (Figure D-1). However, application of this strategy has been limited. Habitat management to reduce beaver populations has the greatest potential for application on federal, state, and county forest lands. At present, there appears to be no large-scale and consistent programs dealing with this beaver damage management strategy.

Continual breaching of dams and removal of dam construction materials on a daily basis sometimes will cause beaver to move to other locations. Water control devices such as the three-log drain (Roblee 1983), the T-culvert guard (Roblee 1987), wire mesh culvert (Roblee 1983), and the Clemson beaver ponds leveler (Miller and Yarrow 1994) can sometimes be used to regulate water levels in beaver ponds. Additionally, the Beaver Deceiver is a water control system that attempts to quiet, calm, and deepen the water in front of culverts (to reduce the attractiveness to beaver) and exclude beaver from a wide area around the upstream opening of the culvert (Lisle 1996). However, the effectiveness of this method has not been evaluated in published documents.

Explosives are defined as any chemical mixture or device which serves as blasting agents and detonators, and these are generally used to breach beaver dams after beaver have been removed from a damage situation. The binary explosives consist of ammonium nitrate and nitromethane, and are not classified as explosives until they are mixed, therefore, are subject to fewer regulations and controls. However, once mixed, binary explosives are considered high explosives and subject to all applicable federal requirements. Detonating cord and blasting caps are considered explosives and WS must adhere to all applicable State and federal regulations for storage and handling. All WS explosive specialists are required to attend 30 hours of extensive explosive safety training and spend time with a certified explosive specialist in the field prior to obtaining certification. All blasting activities are conducted by well trained, certified blasters and closely supervised by professional wildlife biologists. Explosive handling and use procedures follow the rules and guidelines set forth by the Institute of Makers of Explosives, the safety arm of the commercial explosive industry in the United States and Canada. WS also adheres to transportation and storage regulations from State and federal agencies such as Occupational Safety and Health Association (OSHA), Bureau of Alcohol,Tobacco and Firearms (BATF), and the Departments Of Transportation (state and federal).

Beaver Dam Breaching involves the removal of debris deposited by beaver that impedes the flow of water and is generally conducted to maintain existing stream channels and drainage patterns, and reduce flood waters that have

affected established silviculture, agriculture, and ranching/farming activities or drainage structures such as culverts. Unwanted beaver dams can be removed by hand, mechanically or with explosives. Explosives are used only by WS personnel specially trained and certified to conduct such activities, and only binary explosives are used (i.e., they are comprised of two parts that must be mixed at the site before they can be detonated as an explosive material).



WS removal of beaver dams in Minnesota is exempted from U.S. Army Corps of Engineers wetland protection laws since only beaver placed materials are removed and the original cross section of the stream is not altered (C. Hauger, USACE, letter to J. Hart, WS, January 17, 2001).

Beaver dam removal is also exempted from the Minnesota Wetland Protection Act (M.S. 103G.2241 and MN Rule 8420.0115 - 8420.0122, Wetland Conservation Act Exemptions Section B5, Items A and D).

Water control devices (pond levelers) have been used for many years in many different states, with varying degrees of success (Figure C-1). Various types of beaver pond levelers have been described (Arner 1964, Laramie and Knowles 1985, Lisle 1996, Roblee 1984) and installation of beaver pond levelers can be effective in reducing flooding in certain situations (Minn. Dept. Nat. Res. 1997, Miller and Yarrow 1994) if properly maintained. Water control devices generally are of two designs. One design is a perforated pipe passing through the beaver dam (Figure C-1) and the second design is a fence erected 15 - 90 feet in front of the culvert to prevent the beaver from blocking the culvert with debris (Lisle 1996.). The second design may have a perforated pipe going from the fence to the culvert to allow water to flow since the fence may become clogged with debris.

The cost of water control devices is variable, depending on number of devices per dam, type of device, materials used, and labor. Dams may need multiple devices to accommodate the volume of water in the flowage. Materials and installation of water control devices can be relatively modest for a three-log drain (Arner 1964), $496 - $560 for a single modified Clemson leveler, $1050 - $2,300 for a single beaver stop (DCP Consulting, Calgary, Canada, 1996), or over $1,000 for a beaver deceiver (USDA 2000).

The use of pond levelers or water control devices may require frequent maintenance, depending on the type of water control device used. Continued maintenance is necessary for the device to remain operational because stream flow, leaf fall, floods, and beaver activity will continuously bring debris to the water control device. This maintenance of water control devices can be expensive. In New York, annual maintenance of beaver pond levelers was estimated at $867.00. There may be additional annual costs to suppress or eradicate beaver populations to keep the devices operational.

According to the Minnesota DNR, the Clemson beaver pond leveler works best at road culverts, beaver dams on small streams and water level control structures. The leveler is unsuited for situations when the normal water flow exceeds the capacity of one or more levelers; in large watersheds; where multiple beaver dams exist and the drop in elevation is slight; where water surges violently; or at the outlet of a lake where moving ice in the spring will damage the intake device. Likewise, a leveler may not work where there are extensive drainage ditch systems and large agricultural fields (MDNR 1997).

APPENDIX C

Exclusion involves physically preventing beaver from gaining access to protected resources through fencing or other barriers. Fencing of small critical areas such as around culverts and drain pipes can sometimes prevent beaver from plugging them or it is used in situations where girdling or gnawing of trees or shrubs is a concern. In these situations hardware cloth, flashing, grit paint (unpubl. data) or chain links are wrapped around the plants to be protected. Recent preliminary tests by WS's NWRC suggest that sand mixed in paint may be an effective barrier against beaver gnawing and cutting of trees or other objects (D. Nolte, NWRC, unpubl. data). Exclusion has also been used to prevent beaver from plugging road culverts when a metal screen, grate, or fencing is secured in front of the opening. This usually results in beaver using the screen or fencing material to support their dam and seal off the end of the culvert. Construction of concrete spillways may reduce or prevent damage to dams by from burrowing. Rip-rap can also be used on dams or levees at times, especially to deter burrowing. Electrical barriers have proven effective in limited situations for mammals and birds; an electrical field through the water in a ditch or other narrow channel, or hot-wire suspended just above the water level in areas protected from public access, have been effective at keeping mammals and birds out. The effectiveness of an electrical barrier is extended when used in conjunction with an odor or taste cue that is emitted because beaver will avoid the area even if the electrical field is discontinued (Kolz and Johnson 1997).

Protecting ornamental or landscape trees from beaver damage by using hardware cloth, similar screening, grit paint or chain link fencing is frequently recommended WS. This method is used most frequently by property and home owners. It is rarely, if ever, used to prevent large-scale timber or forest damage due to the high material cost and labor required to wrap hundreds or thousands of trees in a managed forest. A variety of road culvert screens or fences have been used by county and local highway departments. In most cases the screens do not solve a damage problem, as workforce is still required to remove beaver dam materials from the screen or fence itself. The main benefit of this technique is to prevent beaver dam materials from being deposited inside the culvert.

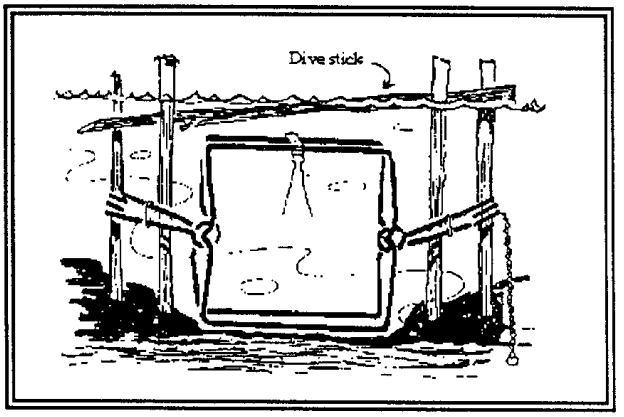
Leg-hold traps can be effectively used to capture a variety of mammals. Leg-hold traps are either placed beside, or in some situations, in travel ways being actively used by the target species. Placement of traps is contingent upon the habits of the respective target species, habitat conditions, and presence of non-target animals. Effective trap placement and adjustment (including pan tension devices) and the use and placement of appropriate baits and lures by trained WS personnel also contributes to the leg-hold trap's selectivity. An additional advantage is that leg-hold traps can allow for the on-site release of non-target animals. The use of leg-hold traps requires more skill than some methods, but they are indispensable in resolving many damage problems. Beaver live-captured in leg-hold traps could be euthanized.

Snares are capture devices comprised of a cable formed in a loop with a locking device and placed in travel ways. Most snares are also equipped with a swivel to minimize cable twisting and breakage. Snares are also easier than leg-hold traps to keep operational during periods of inclement weather. Snares set to catch an animal around the body or leg are usually a live-capture method. Beaver captured in snares could be euthanized.

Hancock traps (suitcase/basket type cage traps) are designed to live-capture beaver. The trap is constructed of a metal frame that is hinged with springs attached and covered with chain-link fence. The trap's appearance is similar to a large clam when closed. When set, the trap is opened to allow an animal to enter the *clam shells*, when tripped the *clam shells* close around the animal. One advantage of using the Hancock trap is the ease of release of beaver or non-target animals. Beaver caught in Hancock traps could also be euthanized. Disadvantages are that these traps are very expensive (approximately $275 per trap), cumbersome, and difficult to set (Miller and Yarrow 1994). The trap weighs about 25 pounds and is relatively bulky to carry and maneuver. Hancock traps can also be dangerous to set (i.e., hardhats are recommended when setting suitcase traps), are less cost and time-efficient than snares, leg-holds, or body-grip traps, and may cause serious and debilitating injury to otters (Blundell et al. 1999).

APPENDIX C

LETHAL DAMAGE MANAGEMENT METHODS



These methods involve damage management specifically designed to remove beaver in certain situations to a level that stabilizes, reduces, or eliminates damage. The level of removal necessary to achieve a reduction of beaver damage varies according to the resource protected, habitat, population, the effectiveness of other damage management strategies, and other ecological factors. Despite the numerous damage management methods developed, trapping remains the most effective method of removing beaver from specific damage areas.(Hill 1976, Hill et al 1977, Wigley 1981, Weaver et al 1985). Intensive trapping can eliminate or greatly reduce the beaver populations in limited areas (Hill 1976, Forbus and Allen 1981). Specific methods of lethal population reduction involve removing beaver with body-grip (e.g., Conibear) and leg-hold traps, snares, and shooting. Beaver can also be live-captured with leg-hold traps, cage-type traps and snares. However, because WS does not relocate beaver in Minnesota, beaver that are live-captured would subsequently be euthanized. These specific methods are described in USDA (1997, Appendix J: 9 - 12). A formal risk assessment of all mechanical devices used by the WS program in Minnesota can be found in USDA (1997, Appendix P). These techniques are usually implemented by WS personnel because of the technical training required to use such devices.

Shooting is selective for target species and may involve either a shotgun or rifle. Shooting is an effective method to remove small numbers of beaver in damage situations, especially where trapping is not feasible. Removal of specific animals in the problem area can sometimes provide immediate relief from a problem. Shooting is sometimes utilized as one of the first lethal damage management options because it offers the potential of resolving a problem more quickly and selectively than some other methods, but it does not always work. Shooting may sometimes be one of the only beaver damage management options available if other factors preclude setting of damage management equipment. WS personnel receive firearms safety training to use firearms while performing their duties.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees who carry firearms as a condition of employment, are required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Body-grip (e.g., Conibear-type) traps are designed to cause the quick death of the animal that activates the trap. The size of body gripping traps generally used for beaver are 10"x10", are used exclusively in aquatic habitats, with placement depths varying from a few inches to several feet below the water surface (Figure C-3). Placement is in travel ways or at lodge or burrow entrances created or used by the target species with the animal captured as it travels through the trap and activates the triggering mechanism. Safety hazards and risks to humans are usually related to setting, placing, checking, or removing the traps. Body-grip traps present a minor risk to non-target animals because of the placement in aquatic habitats and below the water surface.

APPENDIX D

SPECIFIC MITIGATION MEASURES

I. Beaver dam removal near eagle nests.

Listed below are guidelines provided by the USFWS to reduce disturbance to nesting bald eagles (*Haliaeetus leucocephalus)* during dam removal activities. WS will conform to these guidelines.

1) WS will not remove beaver dams with explosives:

a) within 660' of nests during the most critical period and

b) within 330'of nests except during the non-critical period.

2) WS will not remove dams with explosives more than once per year within ¼ mile of an active eagle nest except during the non-critical period.

For the purpose of identifying eagle nesting periods, the USFWS recommends, and WS will use, the following MDNR guidelines:

Most critical period	North of State Hwy. 210, March 15 - May 15 South of State Hwy. 210, February 10 - May 1
Non-critical period	North of State Hwy. 210, October 1 - February 15 South of State Hwy. 210, September 15 - January 10

II. Beaver dam removal near state listed plant sites.

In an effort to avoid harm to two state listed plant species; small white waterlily (*Nymphaea leibergii)*, state threatened, and floating marsh marigold (*Caltha natans)*, state endangered, WS will conform to the following guidelines from the MDNR, Natural Heritage and Nongame Research Program.

WS will not remove a beaver dam that has been in place longer than three years in the following townships without first seeking review from the MDNR Environmental Review Coordinator.

Beltrami Co.
T158N R36W

Cook Co.
T63N R4E
T64N R3E
T64N R4E

Itasca Co.
T56N R26W

Lake Co.
T58N R7W
T60N R6W
T60N R8W

Lake of the Woods Co.
T158N R34W
T159N R35W
T159N R36W
T160N R34W
T166N R35W

Roseau Co.
T159N R37W
T160N R37W
T161N R35W
T164N R37W

St. Louis Co.
T50N R14W
T56N R18W
T57N R20W
T58N R17W
T59N R15W
T59N R16W
T60N R19W
T60N R20W
T62N R15W
T63N R16W
T70N R20W